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[OFFICIAL NOTICE.]

First Annual Meeting, American Gas Institute.

NEW ALBANY, IND., Aug. 8, 1906.

The first annual meeting of the American Gas Institute, composed of the merger of the Ohio, the American and the Western Gas Associations, will be held in the Auditorium Hotel, Chicago, Oct. 17th, 18th and 19th, 1906, and will be called to order by Mr. B. W. Perkins, President of the Ohio Gas Association, who has been selected as presiding officer. The usual rates on certificate plan of 1½ fare are being arranged for. Due notice of the program and matters pertaining to the meeting of the Institute, will be given in subsequent issues of the JOURNAL, and through the mails.

Yours truly, JAMES W. DUNBAR,
Acting Secretary.

[OFFICIAL NOTICE.]

Wrinkle Department, American Gas Institute.

As former editors of the Wrinkle Department of the Western Gas Association and the Ohio Gas Light Association we are requested to collect a budget of wrinkles for presentation at the first meeting of the American Gas Institute, which will be held in Chicago, Ills., October 16th, 17th and 18th, 1906.

Drawings, photographs, sketches and description of any device, formulæ, or methods for accomplishing objects pertaining to the gas business, are respectfully solicited.

Thanking you in advance for contributing promptly. Yours truly,

W. E. STEINWEDELL,
719 Citizens Building,
Cleveland, O.

B. MCADAM,
Milwaukee Gas Light Co.,
Milwaukee, Wis.

[OFFICIAL NOTICE.]

Fourteenth Annual Meeting, Pacific Coast Gas Association.

OFFICE OF THE SECRETARY,
925 FRANKLIN STREET,
SAN FRANCISCO, CAL., July 16, 1906.

To the Members of the Pacific Coast Gas Association—Gentlemen: Although somewhat disfigured, San Francisco is still in the ring, and, Phœnix-like, has already risen from its ashes so that the size of the bird is plainly discernible. We have still left, a few choice meeting places for conventions, and the 14th annual meeting, will be held, as per last adjournment, in the city and county of San Francisco, on Tuesday, Wednesday and Thursday, September 18th, 19th and 20th, 1906. You need not be reminded of the fact that John Martin is the President, to be assured that the program for the next session will outshine in brilliancy, that of any in the past. Good papers on live topics will be furnished, the usual banquet and outing will take place, and it is anticipated that the attendance will far excel that of any previous year. Due notice of papers to be read, and those appointed to discuss them will be given you. It is advisable that you notify this office immediately upon receipt of this, of your intention to be present, in order that accommodations may be reserved for you. Do not forget the "Wrinkle" and "Experience" Editors. While their notebooks may be full of the idiosyncrasies of earthquakes and fire, there is still room for a few more "batches" for those of you who are without the belt of shaking Earth. I am, as I hope you all are, for Greater San Francisco.

JOHN A. BRITTON, Secretary.

P. S.—Members will please advise the Secretary of any change in their address.

[OFFICIAL NOTICE.]

Second Annual Meeting of the Iowa Gas Association

OFFICE OF THE SECRETARY,
413 LOCUST STREET,
DES MOINES, IA., Aug. 1, 1906.

To the Members of the Iowa Gas Association—Gentlemen. The Second Annual Meeting of the Iowa Gas Association will be held at the Savery Hotel, Des Moines, Ia., Aug. 23, 24 and 25. The meeting will be called to order at 10 A. M., by the President, Mr. L. L. Kellogg, of Sioux City, Ia. The Savery Hotel will furnish rooms on the European plan from $1 up, and American plan from $2.50 up, according to location. The following papers will be presented to the Association:

"Results Obtained in Iowa from Operation of Ammonical Liquor Plants," by A. T. Averill, Cedar Rapids, Ia.

"New Business and Most Desirable Methods of Securing Same," by Jansen Haines, Des Moines, Ia.

"Liability of Gas Companies in Cases of Asphyxiation," by Geo. McLean, Dubuque, Ia.

"Gasoline Lighting Competition," by H. E. Morton, Ft. Dodge, Ia.

"Why it is Advisable to Educate the People to an Economical Use of Gas," by Austin Burt, Waterloo, Ia.

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"Oil Tar as a Dust Layer and Weed Destroyer," by Geo. A. Waring, Omaha, Neb.

"Some Brief Notes on High Pressure," by G. I. Vincent, Des Moines, Ia.

"The Gas House Equipment, its Maintenance and Efficiency," by Geo. Warnking, Muscatine, Ia.

On Thursday evening, August 23, there will be a trolley ride to a neighboring summer resort, returning in time for a theater party at a summer theater. On Friday, August 24, there will be a banquet at the Savery Hotel. The Iowa State Fair opens officially on August 24, and reduced rates on all the roads go into effect on August 23. Members can arrange to take advantage of this rate.

F. W. Kelley, Secretary.

BRIEFLY TOLD.

Notes.—

The Consolidated Gas Company, of Boston, Mass., has adopted the employees profit sharing plan, such as has been in use in this country and abroad in many plants for a good many years. About 800 employees will be benefited by this procedure, receiving as the reward for faithful service 7 per cent. of their yearly wages, and increasing with the increase of dividends, which with the sliding scale plan increases if earned with the decrease of price of gas to the people. During the year ending June 30, 1906, the jobbing department executed 173,543 orders, or calls, an average of over 500 calls for each working day in the year. The number of stove orders executed for the period mentioned was 10,738. Most of these calls were made to do gratuitous work on stoves and burners for consumers, and during the year 68,076 new burners were placed free of expense to consumers.

The Everett (Mass.) Gas Company has entered into an agreement with the Boston and Maine Railroad enabling it to lay its pipes on the Railroad Company's land. The Gas Company will, it is said, follow the line of the Saugus branch to its land, and in so doing, will be absolutely independent of the City of Everett. By the latest scheme it will save the franchise tax of $6,000 per year which the city imposed, and the cost of construction will be much less than it would have been if the original project had been carried out. This will permit the Company to transmit water from its wells at Malden.

Notice has been given by order of the Board of Directors that a special meeting of the stockholders of the Cincinnati Gas and Electric Company will be held at the office of the Company, southwest corner of Fourth and Plum streets, Cincinnati, O., on Thursday, the 23d day of August, 1906, at 12 o'clock noon, to take action on the proposition to lease all of the properties, rights and privileges of the Cincinnati Gas and Electric Company to the Union Gas and Electric Company, an Ohio corporation, according to the terms of a lease unanimously approved and recommended by the Board of Directors at a meeting held July 17th, 1906.

Mr. Geo. Williams, in charge of the "New Business Methods" of the American Gas Institute, says, that the report will be presented at the fall meeting in better form than it has been heretofore, and requests contributions at once. The advertisement of the "Institute" will be found in our advertising columns.

Recent Patent Issues.

Prepared for the American Gas Light Journal by Royal E. Burnham, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 10 cents.

826,533. Automatic igniter and extinguisher for gas lamps. Ferdinand Droel, Velbert, Germany.

826,536. Tap for steam, water, or gas, etc. Joseph B. Butterfield, Scarborough, England.

826,659. Apparatus for automatically signaling the presence of deleterious gases in the atmosphere. Henri Hauger, Paris, France.

826,691. Gas purifying apparatus. Schuyler F. Seager, Lansing, Mich., assignor to American Suction Gas Producer Company, same place.

826,742. Process of reducing metallic compounds and producing carbides. Edgar F. Price, Niagara Falls, N. Y., assignor to Union Carbide Company, same place.

826,743. Process of reducing compounds and producing carbides. Edgar F. Price, Niagara Falls, N. Y., assignor to Union Carbide Company, same place.

826,744. Apparatus for reducing metallic compounds and producing carbides. Edgar F. Price, Niagara Falls, N. Y., assignor to Union Carbide Company, same place.

826,745. Apparatus for reducing compounds and producing carbides. Edgar F. Price, Niagara Falls, N. Y., assignor to Union Carbide Company, same place.

826,747. Apparatus for purifying gas. Thomas Redman, Bolton, Bradford, England.

826,814. Prepayment meter. James J. Wood, Fort Wayne, Ind.

826,967. Gaseous fuel burner. Henry Schneider, Kenton, O.

[Official Report—Revised by the Secretary—Continued from Page 232.]

THE TWENTY-NINTH ANNUAL MEETING, WESTERN GAS ASSOCIATION.

Held in Cleveland, O., May, 16, 17 and 18, 1906.

Third Day—Morning Session.

The President—The next paper for presentation is by Mr. Thomas D. Miller,

A BALANCE BETWEEN CALORIFIC VALUE AND CANDLE POWER IN WATER GAS.

Mr. T. D. Miller—My paper being very short, Mr. President, I will ask the privilege of reading it all, because I have only said just the least I could say on the subject.

During the progress of a series of experiments looking toward an increase on an economic basis, in candles per gallon of oil used, as well as in calorific value, it occurred to me that a formula could be evolved which would give as a result a true value, as compared to a standard unit of any gas produced. Should this formula consider the economy of production as well as the value of the gas produced, it would be of great assistance in arriving at conclusions.

The simple question of making a gas of higher candles per gallon than ordinary is one that offers no special difficulties, as this has been accomplished by the use of special designs of oil sprays, but it appears to have been invariably attained at the expense of calorific value. This deficiency would not have been of serious consequence prior to the introduction of the incandescent gas light and the general use of gas as fuel for domestic, scientific and artizan purposes.

At the present time the use of the illuminating quality of gas is growing less in proportion to the use of its heating quality. Therefore it is necessary that as much attention should be paid to calorific value as candle power was formerly supposed to receive.

The electrical unit of energy—viz., the watt, is composed of the product of the voltage into the amperage. As the value of gas has two elements, calorific value and illuminating value, why not establish a single unit of value for the gas and at the same time take into consideration the economy of production. The analogy is, of course, not complete, but goes far enough to have suggested what follows.

Let C = candles per gallon of oil used.
H = B.T.U.'s of 1 cubic foot of gas at 60° F. and 30″ bar.
O = gallons of oil used per 1,000 feet gas made.
G = pounds of generator fuel per 1,000 feet gas made.
K = constant.
E = efficiency value sought.

Then:
$$C\left(\frac{\frac{4}{10}H}{G} + \frac{\frac{6}{10}H}{O}\right)K = E$$

Reducing:
$$\frac{CH}{GO}\left(4O + 6G\right)\frac{K}{10} = E$$

This formula is based on the more or less arbitrary hypothesis that the illuminating power of carburetted water gas is entirely due to the oil, that 40 per cent. of the calorific value of the gas is due to the generator fuel and 60 per cent. to the oil.

The value of $\frac{K}{10}$ was obtained in a more or less arbitrary way by using a standard of 40 pounds generator fuel and 4½ gallons of oil per 1,000 feet of gas made, producing a candle power of 24 and a calorific value of 600 B.T.U.'s per cubic foot. Substituting these values and taking the value of E as 100, we get a value of $\frac{K}{10} = .0218$. On this basis the values of E as shown in Appendix were obtained.

This gives the mechanical efficiency of the manufacture of the gas, but by substituting the cost per unit of generator fuel and oil and determining a new value for K, the value of E' is determined with reference to the financial economy and it was in this way the values of E', E", E"' were determined.

For E': Oil cost $0.02 per gallon..... = O'
Generator fuel cost $6 per ton..... = G'
and $\frac{K}{10}$ was found..... = .0625

For E":.....O" = $0.04 per gallon.
.....G" = $3.00 per ton.
..... $\frac{K}{10} = .125$

For E''': O''' = $0.03 per gallon.
G''' = $5.00 per ton.

We have been using the formula for the past 6 months and have come to look upon it as of great assistance.

It may be, and probably is, susceptible of greater technical accuracy, and if this paper results in perfecting the formula or even in demolishing it entirely, I will feel that something has been accomplished.

APPENDIX.

Ex.	G.	H.	O.	C. P.	C.	E.	E'.	E''.	E'''.
1.....	42.2	558	4.00	23.77	5.94	115.3	111.6	.....	.....
2.....	39.1	556	3.79	24 30	6 41	133.6	125.6	.....	.....
3.....	38 8	556	3.78	24.00	6.34	129.9	125.1	.....	.....
4.....	37.0	564	3.80	24.00	6.32	131.1	128.1	.....	.....
5	35.0	566	3.98	24.00	6 03	119.1	121.0	.....	.....
6.	44.8	578	3.88	24.22	6.24	128.6	120.7	.....	.....
7.....	38.2	584	3.74	24.00	6.42	135.2	134.9	.....	.....
8.....	40.2	526	3.95	24.00	6.08	112 8	108.9	.....	.....
9.....	37.0	602	3.95	24.00	6.07	129.7	127.9	.....	.....
10.....	40.4	577	3.89	23.85	6.13	126.7	121.7	.....	.....
11.....	43.7	578	3.73	24.07	6.45	138.2	129.1	.....	.....
12.....	36.0	546	3.91	23.77	6 08	115.9	116.8	.....	.....
13.....	39.6	562	3.90	23.25	5.96	119.7	115 8	110.7	112.8
14.....	38.9	551	4.06	23.70	5.83	111.1	109.3	105.9	106 6
15	37.1	544	3.96	22.87	5.79	110 9	109.9	107.9	108.3
16.....	32.1	550	3.92	23 25	5.93	118.8	120.34	120.8	121.8
17	42 5	544	4.06	22.95	5.65	106.2	101.2	92.8	97.2
18.....	32.1	542	3.91	22.73	5.81	110.9	112.4	111.9	117.7
19.....	45.8	590	3.54	23.40	6.65	152.4	139.6	123.3	131.77
20.....	39.7	559	4.27	22.57	5.29	97.0	96.0	94.5	.....
21.....	37.5	569	4.18	22.50	5.38	103.0	103.0	102.4	.....
22.....	39.2	551	4.02	23.77	5.95	114 2	111 3	107.7	.....
23.....	36.6	547	4.03	23.55	5.84	111.6	110.7	111.1	.....
24.....	37.6	583	3.88	24.45	6.30	132.8	129.5	125.2	.....
25.....	35.0	595	4.25	25.80	6.07	120 1	122.7	125.8	....
26.....	31.6	564	4.06	25.70	6.33	124.9	129.1	120.1	.....
27.....	38.3	611	4.42	23.55	5.33	103.8	104.7	103.0	.....
28.....	37.4	569	4.25	23.52	5.54	104.8	104.8	104.9	.....
29.....	35.7	575	4.16	23.77	5.71	111.3	112.3	113 6	.....
30.....	36.0	567	4.20	24.00	5.71	108.7	109.7	107.8	.....
31.....	35.8	571	3.85	24.00	6.23	129.5	139.9	125.7	.....
32.....	37.4	561	4.28	24.00	5.60	107.2	103.8	104.4	.....
33.....	37.0	572	4.21	24.82	5.89	112.7	113 0	113.2	.....
34.....	36.6	579	4.23	25.05	5.92	114.2	115 0	116 0	.....
35.....	35.6	570	4.11	22.50	5 47	107.0	108.6	108.5	.....
36.....	35.5	571	4.15	24 97	5 90	114.47	115.43	.....	.....
37.....	30.8	564	4.16	24.67	5.93	114.62	147.6	.....	.....
38.....	33.8	584	4 83	24.22	5.01	86.55	92 3	.....	.....
39.....	37.2	589	4.66	24.64	5.29	101.23	102.44	.....	.....
40.....	37.6	560	4.67	23.65	5.06	85.91	88 06	.....	.....
41.....	36.2	548	4.82	23.62	4.85	78.52	81.65	.....	.....
42.....	35.8	548	4.54	21.90	4.82	82 54	85.05	.....	.....
43.....	35.0	562	4.65	24.30	5.22	89.83	93.92	.....	.....
44.....	34.1	579	4.44	25.2	5.70	114.3	110.5	.....	.....
45.....	35.2	564	4.32	23.55	5.45	100.9	100.0	.....	.....
46... ..	35.2	552	4.29	24.14	5.63	103.0	105.0	.....	.....
47.....	36.1	560	4.70	24.0	5.10	91.66	90.59	....	.....
48.....	36.0	568	4.45	25.50	5.61	101.37	103.82	.....	.....
49.....	35.1	566	4.36	24.75	5.67	104.54	.....	.....	.....

Discussion.

The President—You have heard the presentation of Mr. Miller's paper. It is open for discussion. Mr. McKee.

Mr. McKee—One of the most interesting features of Mr. Miller's paper is the statement that "The simple question of making a gas of higher candles per gallon than ordinary, is one that offers no special difficulties as this has been accomplished by the use of special designs of oil sprays, but it seems invariably to have been attained at the expense of calorific value." Let us examine a few of the examples to see whether or not this statement is borne out. For purposes of calculation we shall assume that the approximation made later on holds true, viz., that $\frac{6}{10}$ of the calorific value of the carburetted gas is due to the oil. The B.T.U. derived from a gallon of oil will then be expressed by the following:

$$\frac{6}{10} \times \frac{H}{O}$$

I have arranged the examples so that the candles per gallon shall be in ascending order.

Example.	Candles per Gallon.	$\frac{6}{10} \times \frac{H}{O}$ = Heat Units per gal.
(47).....	5.10	71,490
(43).....	5.22	72,516
(39).....	5.29	75,837
(45).....	5.45	78,333
(32).....	5.60	78,645
(49).....	5.67	77,890
(44).....	5.71	78,243
(30).....	5.71	81,000
(5)	6.03	85,327
(25).....	6.07	84,000
(6)	6.24	85,152
(3)	6.34	88,254
(2)	6.41	88,031
(19).....	6.65	100,000

From this it appears that when we are working for the greatest number of candles per gallon that we are also working for maximum calorific value and the special oil spray that gives the greatest illuminating value also gives the greatest heating value.

The above table is of course based on the assumption that 6/10 of the heating value is due to the oil. To prove the case absolutely it would be necessary to collect a large number of examples in which the amount of oil added per M is the same and then note if the B.T.U. of the gas increased with the candles per gallon.

The necessity for keeping the oil the same in making these comparisons will be shown in the latter part of this discussion. With the limited number of examples at our disposal it is not possible to find more than three in a group where the oil per M may be taken as identical. Some of these groups are given below.

Number.	Oil per M.	Candles per Gal.	H.
10	3.89	6.13	577
6	3.88	6.24	578
24	3.88	6.30	583
18	3.91	5.81	542
12	3.91	6 08	546
17	4 06	5.65	541
14	4.06	5.83	551

It is evident that in these cases the total heat in the gas increases as the candles per gallon. With a large number of examples having O constant it is possible to settle this important question.

If we desire to assign to the operation of a water gas machine a formula which shall represent its mechanical efficiency it appears that we must take

$$\left(\frac{\text{total heat units received in the gas}}{\text{total heat units applied to the mach.}}\right) + \text{candles per gallon} = \text{K E.}$$

The quantity in brackets represents the calorific efficiency. For the generation of 1,000 feet of gas we may write:

$$\left(\frac{1{,}000\ H}{128{,}000 \times O + 15{,}000\ G}\right) \times C = K\ E$$

Here 128,000 = the number of heat units in 1 gallon oil
and 15,000 = " " " " 1 pound coke.

So far as the calorific part of it goes, this formula is absolute, since it represents the ratio of the total heat delivered by the machine in the form of useful gas, to the amount of heat supplied to it. As to the justice of multiplying this by the candles per gallon, I am not so sure, but for purposes of comparison with Mr. Miller's results I have worked out some of the examples to show the effect of his arbitrary assumption that $\frac{6}{10}$ of the calorific value is due to the oil. The above formula is open to the objection that from the very nature of the water gas process we can never get anything like full value from the heat units introduced as solid fuel. So before applying the formula it must be modified according to Mr. Miller's standard case and a suitable constant derived so that the efficiency for the standard case equals 100. Let us assume 1 gallon oil = 60 feet of gas (according to Miller's standard case = 55.5). 1,000 feet of blue water gas = 332,000 B. T. U. 1,000 feet of carburetted gas of 600 heat units = 600,000 B. T. U. This is derived from 4½ gallons oil and 40 pounds coke; 4½ gallons oil = 4½ × 60 = 270 feet gas. Therefore the 40 pounds coke gave rise to 730 feet of gas. Since 1,000 feet of water gas = 322,000 B. T. U., 730 feet (from 40 pounds coke) = 235,000 B. T. U. = 5,875 B. T. U. per pound of coke.

In the standard case 1,000 feet of gas contained 600,000 B. T. U. The blue gas contained 235,000 B. T. U. Therefore the 4½ gallons contained 365,000 B. T. U. Therefore 1 gallon oil gave rise to 81,111.1 B. T. U.

We may now rewrite our formula in accordance with the standard case thus:

$$\left(\frac{1{,}000\ H}{81{,}111.1\ O + 5{,}875\ G}\right) G = K\ E.$$

Substituting H = 600; O = 4½; G = 40; C = $\frac{24}{4\frac{1}{2}}$ we get K = $\frac{48}{900}$

I believe this formula to be superior to the one given in the paper for

the reason that where the gallons of oil per 1,000 feet of gas changes, the formula adapts itself to the change. If, as Mr. Miller says, 60 per cent. of the calorific value is due to the oil, it is manifestly very inaccurate to vary the oil 25 per cent and still use the same formula. Following is a list of examples worked out according to this new formula and compared with the results given by Mr. Miller. It is apparent that where the oil is less than in the standard case that Mr. Miller's results are too high, and where O 4½ that his results are too low and by a percentage great enough to absolutely condemn any formula that sets once for all the proportion of the heating value due to the oil.

$O < 4\frac{1}{2}$

No.	E (according to Miller); $E = \frac{1}{K}\left(\frac{1{,}000\,H}{81{,}111.1\,C + 5{,}875\,G}\right)C$	
1.	129.9	123 9
2.	133.6	121.6
3.	115.3	110.8
4.	131.1	127.3
5.	119.1	116.6
6.	128.6	117.25
7.	135.2	133.18
8.	112.8	107.7
9.	129.7	127.4
10.	126 7	120.0
11.	138.2	124 9
12.	119.08	117.7
13.	119.7	114.4
14.	111.1	107.9
15	110.9	109.5
17.	106.2	99 52
19.	152.4	132.3

$O > 4\frac{1}{2}$

No.	E (according to Miller); $E = \frac{1}{K}\left(\frac{1{,}000\,H}{81{,}111.1\,O + 5{,}875\,G}\right)C$	
38.	86.55	93.11
39.	94.76	97.94
40	85.91	88.46
41.	78.52	82.41
42.	82.54	85.6
43.	89 93	94.17
47.	86.3	90.25

There still remains one important factor to consider in Mr. Miller's efficiency formula—viz., the candles per gallon. From the published work on the enriching power of ethylene, acetylene and benzole, on simple gases and gaseous mixtures, one would hardly expect that it would be equally easy to obtain high candles per gallon when using, say 5 gallons oil par 1,000, as it would with only 3 or 3½ gallons per 1,000. Fortunately with the large number of examples supplied, we can easily find whether or not this is the truth. To this end I have arranged the oil in an ascending series as follows:

No. of Example.	Oil per M.	Candles per Gallons.	No. of Example.	Oil per M.	Candles per Gallon.
19.	3.54	6.65	36.	4.15	5.90
11.	3.73	6.45	37.	4.16	5.93
7.	3.74	6.42	29.	4.16	5.71
3.	3.78	6.34	21.	4.18	5.38
2.	3.79	6.41	30.	4.20	5.71
4.	3.80	6.32	33.	4.21	5.89
31.	3.85	6.23	34.	4.23	5.92
6.	3.88	6.24	25.	4.25	6.07
24.	3.88	6.30	28.	4.25	5 54
10.	3.89	6.13	20.	4.27	5.29
13.	3 90	5.96	32.	4.28	5.60
12.	3.91	6.08	46.	4.29	5.63
18.	3.91	5.81	45.	4.32	5.45
16.	3.92	5.93	49.	4.36	5.67
8.	3.95	6.08	27.	4.42	5.33
9.	3.95	6.07	44.	4.44	5.70
15.	3.96	5.79	48.	4.45	5.61
5.	3.98	6.03	42.	4.54	4.82
1.	4.00	5.94	43.	4.65	5.22
14.	4.06	5.83	39.	4.66	5.29
17.	4.06	5.65	40.	4.67	5.06
22.	4.02	5.95	47.	4.7	5.10
23.	4.03	5.84	41.	4.82	4.85
26.	4.06	6.33	38.	4.83	5.01
35.	4.11	5.47			

From the above it is at once apparent that it is easy enough for the operator to secure 6 or more candles per gallon when O is from 3½ to 4, whereas when O runs from 4½ to 4.6 he only gets about 5. If we add the figures in the above column together by fives and take the average, we get the following series of numbers:

Oil per M.	Candles per Gallon.
3.716	6.454
3.86	6.244
3.918	5.972
3.99	5.93
4.056	5.848
4.17	5.726
4.242	5.742
4.334	5.536
4.548	5.328
4.755	5.008

From these we can plot a curve with the oil per M on one axis and candles per gallon on the other. This curve is shown in Fig. 1.

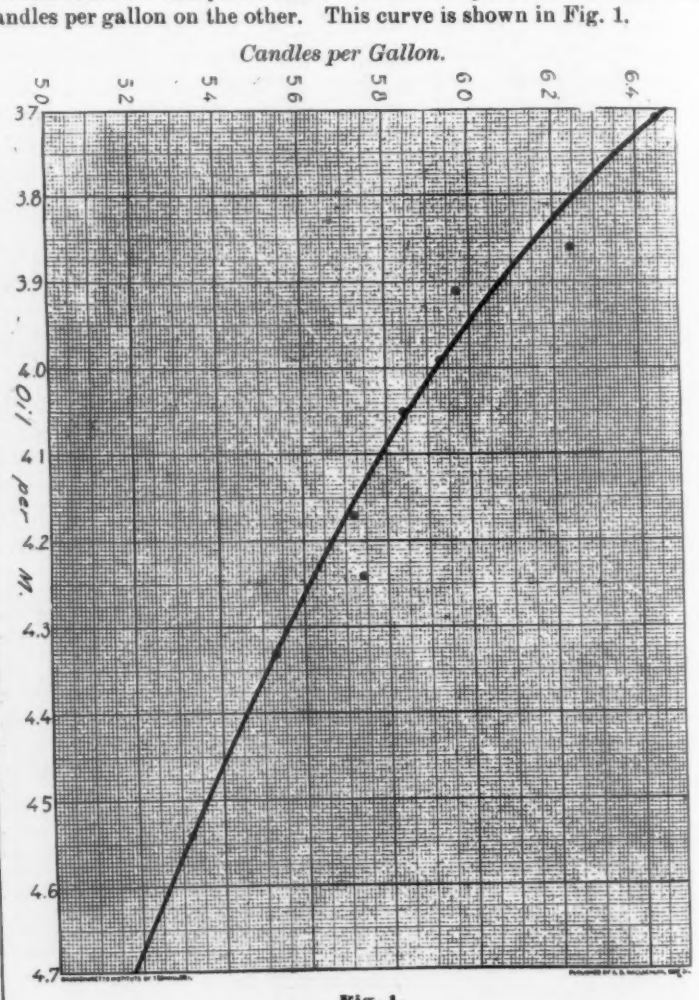


Fig. 1.

We can now rewrite an efficiency formula of the form

$$\left(\frac{\text{B.T.U. in the gas}}{\text{B.T.U. supplied to machine}}\right)\frac{C}{C_1} = K\,E$$

Here C_1 is the number of candles we may reasonably expect by careful operation. Its value is obtained for each example direct from the curve or from a set of tables made upon from the curve. Using that part of the equation for the heating value of the gas which we developed above we may write—

$$\left(\frac{1{,}000\,H}{81{,}111.1\,O \times 9{,}875\,G}\right)\frac{C}{C_1} = K\,E$$

$$\text{Here } \frac{C}{C^1} = \frac{\text{Candles per gal. obtained}}{\text{Candles per gal. which represents good practice}}$$

In Mr. Miller's standard case O = 4 ½.
Therefore from the curve $C_1 = 5\ 37$.
Substituting the other values of the standard case, viz.:

$$H = 600 \quad G = 40 \quad \text{we find the value of } \frac{1}{K} = 100.6875$$

We can now recalculate some of the above examples according to this new equation. In the column marked E (M) are the results of the same examples by Mr. Miller's formula.

No.	E (M)	$E = \frac{1}{K}\left(\frac{1{,}000\,H}{81{,}111.1\,O + 5{,}75\,G}\right)\frac{C}{C^1}$
1	115.3	98.5
2	133.6	111.4
3	129.9	105.85
4	131.1	109.3
5	119.1	105.4
6	128.6	103.
7	135.2	111.9
8	112.8	96.6
9	129.7	114.2
10	126 7	105.8
11	138.2	104.9
12	119.08	104.3
13	119.7	100.1
14	111.1	99.3
15	110.9	100.7
16	118.8	107 3
17	106.2	89.44
19	152.4	106.4
38	86.55	99.02
39	94.76	100.95
40	85.91	91.34
41	78.52	87.33
42	82 54	85.83
43	89.83	97.09
47	86.3	93.75

In examples 42, 43 and 47, where O is high, it still appears that the results are generally low. The reason for this is no doubt to be found in the fact that we are here taking the values of C, from near the end of the curve. It is nevertheless apparent that we have arrived at a formula which gives results that are much more in accord with what we would expect. Of course, before a curve for the determination of C could be absolutely relied upon, it would have to be made up from a special set of tests in which the conditions were watched very closely. I am not favorably impressed with the idea of trying to extend the application of an efficiency formula so as to take in the price of oil and fuel. Its field of usefulness is probably limited to enabling us to pick out a good water gas maker or in holding a check over the operation of a water gas plant.

The President—I think such work as Mr. McKee has done in the presentation of his results this morning fully justifies the plan that we have adopted this year of asking a few gentlemen to prepare discussions in advance. Such a discussion as Mr. McKee has presented could never have been made on the floor. There was a contribution by Mr. Earnshaw. Will Mr. Forstall read that, please?

Mr. Earnshaw (read by Mr. Walton Forstall—Mr. Miller has certainly originated a unique way of solving the problem stated in the title of his paper, but I am unable to entirely agree with his conclusions, and it seems to me that a different point of view should have been adopted. Carburetted water gas is sold for two distinct uses, light and heat. The measure of light is candle power and the measure of heat is B.T.U. per 1,000. A consumer using the gas for light in an open flame is not at all concerned in the B.T.U., and *vice versa*. Hence it appears to me that these two values are so distinct that they cannot be confounded in one calculation and must be considered separately. The cost per candle power is the unit for comparison in considering the financial economy from the lighting value standpoint, and if the cost per candle power of the standard gas is C, and the cost per candle power of the compared gas is C', then the financial economy is $E^1 = \frac{C}{C}1$ In like manner the unit of comparison for heating value is the cost per B.T.U. per 1,000. Assuming H and H' for the respective costs, we have for the financial economy of heating value $E^1 = \frac{H}{H}1$. If we assume that the lighting and heating values are of equal importance to the average consumer, it might be fair to combine the two values of E' and obtain an average financial economy $E^1 = \frac{1}{2}\left(\frac{C}{C^1} + \frac{H}{H^1}\right)$. Applying these formulæ to each of the three sets of conditions under Exp. No. 13, and taking the standard assumed by Mr. Miller—

$$13a\ \frac{C}{C^1} = 1.034;\ \frac{H}{H^1} = 1.000;\ E^1 = 1.017$$

$$13b\ \frac{C}{C^1} = 1.036;\ \frac{H}{H^1} = 1.044;\ E^1 = 1.040$$

$$13c\ \frac{C}{C^1} = 1.008;\ \frac{H}{H^1} = 0.974;\ E^1 = 0.991$$

The above calculations take into account only the cost of manufacturing materials, but a true comparison should include also all expensse which go to make up the holder cost of the gas. In considering the manufacturing efficiency it is clear that as all of the lighting value comes from the oil, the candle power per gallon of oil used per M is the measure of the lighting efficiency.

$$\frac{\text{Candle power per gallon of compared gas}}{\text{Candle power per gallon of standard gas}} = \frac{c^1}{c} = E^1$$

The percentage found in the gas of the total heat units originally in the oil and coal used represents the actual heat unit efficiency.

$$\frac{\text{B. T. U. in gas}}{\text{B. T. U. in oil + B. T. U. in coal}} = p,$$

and the heat unit efficiency as compared with the standard gas is

$$\frac{\text{Efficiency standard gas}}{\text{Efficiency compared gas}} = \frac{p}{p^1} = E^1$$

Assuming a heating value of 135,000 B. T. U. per gallon for the oil used and 13,500 B. T. U. per pound for the coal used, and assuming an equal value for the heating and lighting efficiencies, we find in Exp. No. 13.

$$\frac{c}{c^1} = 1.118;\ \frac{p}{p^1} = \frac{.53}{.52} = 1.019;\ E = 1.068$$

These values both for E and E' differ very materially from the results obtained by using Mr. Miller's formula and from my point of view more nearly represent a true comparison.

The President—We also have a contribution from Mr. Redding. Will you read that, Mr. Forstall.

Mr. Redding (read by Mr. Walton Forstall)—If heavy petroleum oil be distilled two or three times, as in a glass tube bent at right angles, the constitution of the oil is changed, since the complex molecules of the oil are not sufficiently stable to undergo distillation under pressure without breaking up into simpler hydrocarbons—lighter oils. Undoubtedly this is one of the first changes that occurs in the carburetter. These lighter oils, under the continued action of heat, decompose into permanent gas s and light vapors with the liberation of more or less hydrogen. Tocher (Jour. Soc. Chem. Ind., 1894, Vol. 13, page 231) studied the action of heat on two pure members of the paraffine—actane (C_8H_{18}) and decane ($C_{10}H_{22}$). He found that these bodies "cracked" into simpler liquid members of the same series, accompanied by olefines, paraffines and hydrogen. At a temperature of 500° C, ethylene (C_2H_4), higher olefines, methane (CH_4) and hydrogen were produced; at a temperature of 900° C, ethylene, methane and hydrogen resulted. He also studied the "cracking" of mineral oils, using a retort 36 inches by 6 inches under conditions very similar to the Pintsch, Patterson and Keith processes for oil gas. On mineral oil of sp. gr. .847 he got at 600° C, 13.7 per cent. H; at 800°, 11.9 per cent. H; and at 1,100°, 28.4 per cent. H. On mineral oil of sp. gr. .884 he got at 500° 12.7 per cent. H; at 600°, 8.1 per cent. H; and at 850°, 16.1 per cent. H. He found also that he got the highest value in candles per gallon of oil at a temperature of 800–850° C, at which temperature he got from 12 to 16 per cent. of free hydrogen. This study brought out clearly the fact that the percentage of hydrogen produced depends on the heats, increasing with the heats. Since the working conditions of the carburetter are not radically different from the conditions of Tocher's experiments, it is a logical conclusion that some hydrogen is produced in the carburetter, the quantity being a variable dependent on the heats, the nature of the oil, and the conditions of operation. In order to get some idea of what percentage of hydrogen is produced in the "cracking" of oil, I made a series of analyses of our Pintsch gas. The average of these analyses gave 14.02 per cent. hydrogen in the pure oil gas. However, if we study the composition of an average carburetted water gas, bearing in mind that the blue gas itself has a little larger percentage of hydrogen than carbon monoxide, we are forced to conclude that the percentage of hydrogen produced in the carburetter is not quite so large as Tocher got at his higher temperatures, or as the Pintsch gas shows. A study of the accompanying table of analyses of typical carburetted water gas will make this fact evident.

	CO_2.	O.	Illum.	CO.	CH_4.	H.	N.	B.T.U.	B.T.U. CO and H.	Per Cent.
Av. of N. O. gas for '05.	2.53	.61	9.52	30.69	18.22	33.00	5.43	565	219	38.65
Hickenlooper	2.49	.87	10.65	30.79	19.10	30 14	5.96	578	209	36 20
Butterfield...	1.54	...	14.03	33.92	13 58	35.17	1.76	616	237	38.47
Moorhead....	4 50	.50	13.00	29.00	16.00	32.00	5.00	597	209	35.00

The analyses on which the formula is based correspon l closely to the analyses of a typical carbur etted water gas as given by Butterworth

and Morehead, and may be considered typical. If we consider the percentage of hydrogen due to the "cracking" of the oil in the carburetter negligble, then the ratio of 40 to 60 is not far from the true one. As will be seen by reference to the preceding table, the exact ratio on New Orleans gas is 38.65 to 61.35; on Hickenlooper's analysis, 36.20 to 63.80; on Butterworth's analysis, 38.47 to 61.53; on Morehead's analysis, 35 to 65. On the other hand, if we assume that the same percentage of hydrogen is liberated in the carburetter as we have in our Piutsch gas, then the ratio of 40 to 60 is a little high. Granting that the percentage is the same, approximately 4.5 per cent. of the hydrogen in carburetted water gas is due to the oil, and the ratio on our gas becomes 35.93 to 64.07, or in whole numbers, 36 to 64. Thus far I have not done enough work on the study of the percentage of hydrogen produced in the carburetter to justify drawing a conclusion, but, considering the fact that a part of Tocher's experiments were made at temperatures considerably above those found in the usual working condition of the curburetter (this being also true of the pure oil gas processes), and remembering that the percentage of hydrogen produced is almost entirely dependent on the temperature, I am inclined to think now that the percentage of hydrogen produced in the carburetter is smaller than that found in oil gas. In view of these facts I think that a ratio of 38 to 62 will very nearly express a true value on our gas. A poor gas of say 475 heat units, or a gas of 700 would be out of the range of this formula, since a great percentage of the B. T. U.'s are mostly due either to the blue gas or to the oil constituents respectively. But for an average carburetted water gas of about 575 heat units I believe the use of this formula will give a reliable indication of the quality of results attained.

The President—Is there any further discussion on Mr. Miller's paper? Mr. Egner.

Mr. Egner—Mr. President, I want to emphasize what you said just now, that such discussions as we have had, in effect regular set papers in the shape of discussions, could not have been prepared on the floor of the Association, and I hope that when the journals print these discussions they will make mention of the fact that they were previously prepared. On the way here on the railroad I read all these papers. After I had read this one by Mr. Miller I found I had marked it "O. K." "O. K.," page by page, and I thought he was all right until I heard this discussion. Now I think that he was very fortunate indeed to say at the end: "It may be, and probably is, susceptible of greater technical accuracy, and if this paper results in perfecting the formula, or even in demolishing it entirely, I will feel that something has been accomplished." He has left himself a way of escape, though he is here to talk for himself. This Association is about to enter the wedding engagement that was announced last night. If it was not, however, I should suggest a motion that the last two speakers and Mr. Miller be appointed a committee to continue this thing and form a really good formula that we could work by. But under the circumstances I suppose we will have to be satisfied and work it out for ourselves until the American Gas Institute gets busy.

The President—Mr. Egner, I will entertain a motion to the effect that a committee be appointed to continue the investigation, in the event that Mr. Miller desires to have it done. Naturally Mr. Miller would be the chairman of the committee. I am sure the Gas Institute, if there is to be a Gas Institute, and I think there is, will be very glad to receive suggestions of this kind for its own work. It has got lots to do, and lots to learn, and it will be very glad to take over the assets of the auxiliary associations, or the merger associations, and one of the chief assets it is to take are the brains of the men. I am sure it wants Mr. Miller, and it wants Mr. McKee, and it wants the other men who have contributed. Of course Mr. Miller will have the closing of the discussion, and if he wishes to have this matter continued, if he is not satisfied with the closing, he can ask for a committee. and I will be glad to entertain your motion then. Is there any further discussion?

Mr. Egner—Is a motion in order now, Mr. President?

The President—I will give Mr. Miller the floor. Any further discussion? Mr. Miller, will you make the closing argument?

Mr. T. D. Miller—Mr. President, I think at any rate I intended to be perfectly plain in what I said, that I wanted to start something. The fact that a kite started without any tail has wound up with a tail a great deal longer than the kite itself, is pretty good evidence that I succeeded admirably. The paper has been discussed here by three gentlemen, whose technical training and practice at this time is certainly very much higher than mine. They are very much beyond me in ability to handle the technical part of a proposition of this kind. Possibly 25 years ago, when I was right fresh out of college, I would have felt more at home on a proposition of that kind. The chemical phase of it is discussed by Nr. Redding, who is our chemist, and he and I worked this thing up to this point. The object that I had in view, while not fully met by this formula, was certainly accomplished to a certain extent. Those gentlemen have opened up further possibilities of it. So far as the use of that formula on a financial basis goes, the point of consideration was not how much heat unit or how much candle power is in this oil, it is how much are we getting, and how much is it costing, and can we vary these proportions. With high coke and low oil can we run our generator fuel down and our oil up and produce a gas that will be satisfactory, or reverse it, with a low cost of generator fuel and a high cost of oil run our generator fuel account up and reduce the oil account, and thereby produce economy in cost one way or the other? The psychological effect of that great variation in the results is something that the gentleman lost sight of entirely, because he was looking at it from a purely scientific standpoint. If a man is making a gas that gives a resultant value that shows up to 140 or 150, he is pretty well satisfied with himself, and if he gets down a little bit, and it drops down to 75, he hustles, and he hustles hard. If that variation is only about 8 per cent. above or below the standard gas, the psychological effect is not there at all. As a purely scientific proposition it perhaps does not accomplish what is wanted. I tried to make sort of a combination, science and economy, the business end of the thing, together, and I don't feel that I have been criticised at all in the sense that one would say that he had made a serious blunder and was corrected. I don't feel that way. I feel under very great obligations to these gentlemen that have taken this up. I discussed this subject, made a little memorandum of it last October at the American meeting, and I believe I did talk to the men who are best posted on water gas making and from a scientific standpoint, but I did not find a single man that would promise to give me an opinion on the subject until he had studied it three or four weeks. Mr. Earnshaw has had this thing before him ever since then when he got a copy of the paper, and he seems to have studied it from the standpoint of the consumer. Well, of course, you have got to use that too. He assumes that half the gas is used for illuminating and half of it is used for fuel, which is probably very nearly correct at the present time in the majority of the plants. That is getting away from my object entirely. My object was, as I say, to have a single unit of value that would show me immediately when returns came up from the works whether we were operating on an economical basis, and the wide variation that formula gave me was just like an exaggerated scale on a pressure gauge.

The President—Do you care to continue the study of the subject, Mr. Miller?

Mr. T. D. Miller—I would be delighted, if the gentlemen are interested enough in it, to carry it on further. We are not going to drop it down there. I should be very glad to see the thing put into some sort of permanent shape. I cannot delude my mind of the idea that there is something more here and we have not gotten to it all yet.

The President—Now, Mr. Egner.

Mr. Egner—Mr. President, I will accordingly make the motion which you have suggested, that Mr. Miller as Chairman, and the other two gentlemen with him continue the investigation. (Adopted.)

The President—I will appoint Mr. Miller, Mr. Mckee and Mr. Earnshaw a committee to continue the investigation on the economic balance between calorific value and candle power in water gas.

Mr. T. D. Miller—Will you let me suggest to put Mr. Redding on that committee?

The President—I thought that Mr. Redding would be with you, Mr. Miller.

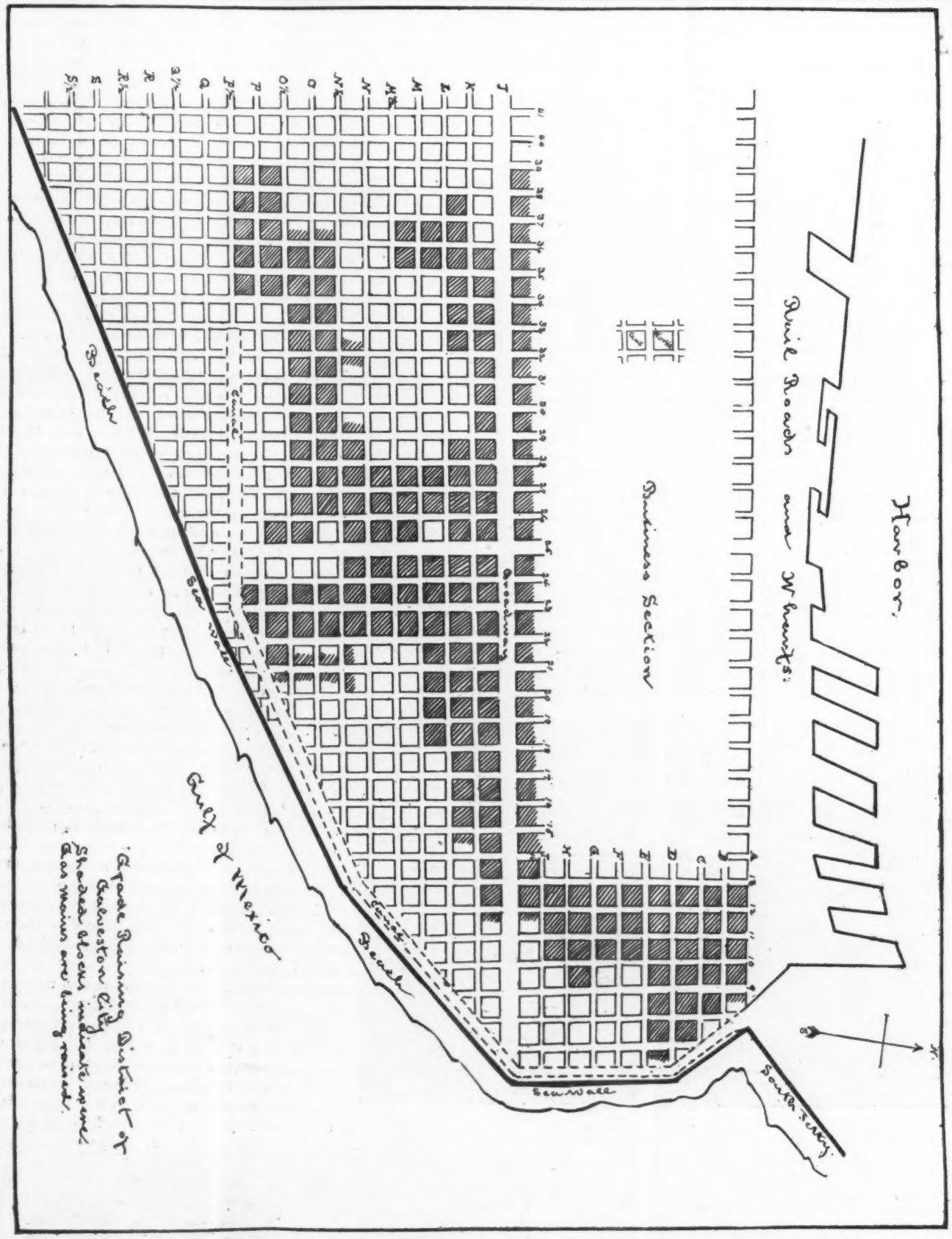
Mr. T. D. Miller—I know, but I would like him to get a little bit of the distinction as well as doing all the work. He did all the work.

The President—I will add Mr. Redding to the committee. The next paper in order is the

CHANGE IN GRADE OF MAINS AT GALVESTON,

to which Mr. Gimper has also given an auxiliary title, "My Excuse for being Absent from the last Meeting." Mr. Gimper, of Galveston, Tex.

Mr. President and Members of the Western Gas Association: The consequences of the memorable Galveston storm of September, 1900, have not been met by the Galveston Gas Company. Since then the city has built a sea wall 3 miles long and 16 feet high above sea level. From this 16-foot level a new grade has been established by the city. Commencing at 6th street, the easterly end of the city (see map), going westerly to 13th street, and from the sea wall on the south from 13th to 39th street, going northerly to Broadway, about the center of the city. This territory comprises principally the resident portion of the city,



and the grade to be raised where our street mains are lying is from 3 to 8 feet, and the sizes of mains are 3, 4, 6 and 8 inches.

The majority of these mains were laid many years ago, since which time the tendency has constantly been to raise the grade of the streets in order to get better drainage. For it must be remembered that Galveston is situated on a low, level, sandy island. By reason of this gradual filling of the streets all the old mains are from 4 to 5½ feet deep and practically in water.

It was evident to the Gas Company that the mains should not remain at this low level in the grade-raising district, for the increased fill would make connections and repairs very expensive and difficult, when the nature of the soil, with quicksand as a foundation, is taken into consideration. The only solution of the problem before us was to raise the mains. Three methods suggested themselves:

First, to raise the mains, after the grade had been completed, laying new ones where the old ones could not be profitably raised. This plan was adopted by the City Water Department.

Second, to take up the mains in the sections to be filled and relay them to conform to new grade when completed.

Third, to raise the mains before the grade was raised.

The first method was rejected on account of the increased cost of raising the mains and the greater risk of breakage, especially with the smaller sized mains. This was fully demonstrated by the City Water Department, which, after weeks of hard work, accomplished practically nothing, gave up its job, advertised for bids, rejected all bids, declaring it would bankrupt the city to accept the prices demanded by the contractors.

The second method was also rejected on account of the loss of busi-

ness, the time intervening between taking up the mains and relaying them being too long, which was proven later on to be correct.

The third method, therefore, was adopted, and the supply of gas maintained during the raising of mains and services. Only temporary interruptions occurred from breaking of mains and laying new services. Fortunately all the street mains had been laid with lead joints. In order that you may better understand the pleasant job I undertook, it may be well to state the method by which the grade is being raised.

Eleven million cubic yards of filling is required to complete the new level, and it is done by the wet process, sand and water being pumped; the sand remains and the water returns from whence it came. To do this work the contractors dredged a canal parallel, or nearly so, with the sea wall, 20 feet deep and 200 feet wide, and from this canal the dredges pump sand and water into the sections to be filled. The contractors are allowed to fill 16 blocks at one time, and they have the privilege of taking the earth from any street in the section to be filled for constructing dams and ditches to confine the sand and return the water to the canal.

Many unforeseen difficulties arose from this procedure. In several blocks they took all the earth from our mains and services. Two lines of mains came within their drainage ditches (see Fig. 1), so that the mains had to be supported by 4 by 4's and cross pieces spiked to them. At times the dams were not high enough or too weak, and the water would overflow or break through into the section where we would have an open ditch. This would generally happen during the night; the result, of course, was very annoying. This, however, occurred only at the beginning.

In the early days of Galveston many bayous existed, which were in time filled and streets laid through them; eventually gas mains were laid in those streets. To make excavations in those localities is very troublesome to this day, and especially after rains. Cave-ins occur in good localities, but are the regular rule in these old bayous. As soon as a main was raised from its watery bed, sometimes only the height of its diameter. the void thus created would immediately be filled by the soft sandy sides slipping down, a crack would form on top, and before we could prevent the falling of the bank upon the suspended pipe it would be buried again, and if it happened to be a 3-inch pipe it would sometimes break. While I have never had any particular love for a 3-inch pipe, I have now a perfect contempt for it.

The contractors always prepared the section adjoining the one they were filling a month before they pumped into it, which meant the destruction of all surface drainage in that section, so that after rains the water had no way of escape. It was therefore not desirable to do any ditching in that section, hence we pushed our work into the second section. In doing so, however, we encountered the difficulty of protecting our service pipes from wheel travel until the section would be closed. It seemed like every delivery wagon, dray, automobile, lumber, brick and beer wagon would always drive, not where we provided a good crossing for them, but where they could do us the most harm. Sometimes within a month we would have to relay services having been bent and trapped. It was of the utmost importance to have no breaks or leaks, for it would be utterly impossible to find them when pumping had begun.

Since not only streets and alleys, but lots also, were raised to grade, the houses likewise had to be raised above grade. To keep up the supply of gas during the house raising, the service riser was cut and a piece of garden hose connected with it until the house was up to the proper height, when permanent connection was restored. The house raiser and brick mason often gave us trouble by setting cribbing and jackscrews or a brick pier over a service pipe; the result I need not describe. the city authorities thought it prudent to lay as many sewers as possible before the grade raising, and, as a matter of course, they would find our gas mains in their way. The order to move our main came very promptly, and often at a time when I could the least spare men and tools. Our cup, however, seemed not to be full yet, for the City Water Department concluded to adopt our method to raise their water mains ahead of the grade raising. They decided to lay their mains on top of the streets, which caused us to cut our pipes wherever they crossed us

The raising of the mains was accomplished with chain blocks and derricks (Fig. 4) after stripping mains and services. No special engineering features were called for; care had to be exercised not to place derricks too far apart; raising was done simultaneously with all the block, and all serviees had previously been cut. Filling followed at once under the main, and when raised high enough two solid beds were tamped under each length of pipe, and a piece of 2×8×18 or 20 inches long of yellow pine was tamped to true grade; all the joints were then cleaned and calked over.

It was predicted that when the water would reach this new made ditch, traps would be the result, and I confess I had some misgivings about the final outcome, but I am happy to say that only in two instances did any traps occur. One case was where a large discharge pipe delivered water directly against our 3-inch pipe line (see Fig. 2), and no doubt undermined it. In Fig. 3 you will notice a later method of discharging through an upturned elbow; by this manner there is no wash or undermining. The second instance was where only one piece of yellow pine was used instead of two under each pipe. The large flood of water spreading

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

over the whole pipe line is no doubt a safety factor in settling everything uniformly, and I do not now anticipate any further trouble.

About 3 months after the first 3 sections were completed, the question arose concerning the extension of a block of mains. The attempt to find the end of the main was made, but we utterly failed, because we had only shovels to dig with while we needed buckets 20 inches below the surface. Five months later we succeeded in making the extension. This was on Thirteenth and Broadway, where only a 3-foot fill was made. These conditions do not obtain everywhere, for when 2 months after the filling had been completed on Twenty-first and Avenue P, and one block from the canal, we laid a new service pipe, the main was 7 feet 4 inches deep, and we found better conditions than on Broadway, due no doubt to the closer proximity to the canal, which facilitates drainage, but two blocks further from Avenue P it was 5 months before we could make an extension to our mains. We had occasion to dig down through that, and dig down into the old ground, where our main was about 6 or 8 inches in the old ground, and the old ground was drier than it was above it. There is a great difference in the kind of material the dredges pick up in the channel; sometimes it is purely quicksand, and again it is coarse sand and fine shells.

The raising and relaying of the mains and services has not altogether been a loss to the Gas Company; we found connections of which we had no record; old, leaky service pipes lost for 20 years furnish no longer water into the mains or loose gas. The number of pumping stations have been reduced. Eighty-four blocks, 3 street intersections and over 400 services have been gone over during 1905. There still remains the southwestern part of our street main system to be raised.

Discussion.

The President—You have heard the presentation of Mr. Gimper's paper, gentlemen. It is open for discussion. Mr. Miller, will you say a word?

Mr. T. D. Miller—I feel, Mr. President, that about all I can say in regard to Mr. Gimper's paper is that I most heartily congratulate him on being through the worst part of it.

Mr. M. S. Greenough—Mr. President, I would like to say a word about Mr. Gimper's paper. I don't think that a man who has not seen Galveston has any idea of the difficulties under which Mr. Gimper has been struggling. I was invited 2 months ago to join a party of railroad officials. We went by steamer to Galveston, and then took cars there, going up through the State of Texas. I had the pleasure of driving round Galveston with a gentleman who is the agent of the Board of Trade, and I was immensely impressed, and I am very glad to have the opportunity to say so publicly, with the courage and determination shown by the citizens of Galveston, who are raising the whole level of the city, in some places as high as 8 feet. To build a wall surrounding the city, and to adapt themselves to the situation, shows an immense amount of pluck on the part of those people down there. It was a great undertaking. When you drive along through one of these recently filled streets, and see the houses all on struts in the air, waiting for their electric lights, sewers, water pipes, gas pipes, to be put in, and the ground to be filled in underneath them, you realize its extent. I must say that I think if I had been the president of the gas company down there I should have been inclined to let those gentlemen wait about 6 months before I tried to give them any gas. I think Mr. Gimper has done wonderfully well in meeting the difficulties with which he has struggled. Nobody could see that place without wishing the citizens of Galveston every success in the enterprise that they have undertaken, to build up that city to the place where it stood before. After the storm, when 10,000 people were drowned, many of the inhabitants fled, as you might say, to the main land, and did not come back. At the present time I understand they are all returning to their homes and settling down there. With the energy which they have shown they have made Galveston the second greatest export city in the country. I believe that is right, Mr. Gimper.

Mr. Gimper—Yes, sir.

Mr. Greenough—I had no conception of the business that was done there, or of the future that awaited that city on that sandy island. I think the Association ought to congratulate Mr. Gimper and his company on the courage they have shown in attending to business as they have.

The President—Is there any further discussion?

Mr. Walton Forstall—I think it would be interesting if Mr. Gimper would give us the data entirely upon the idea of about what it cost him per foot. He chose the method he did, because it was cheaper than the method of letting the pipes be covered up and then digging for them, or in some cases putting in new mains. We all have, not exactly troubles of that kind, but problems similar enough, so that we would like to get all the data we can. Unless the conditions surrounding Mr. Gimper were so peculiar that he thinks the facts he could give us would not pay to put on record for any other city, it would be interesting to reduce the thing to cost per foot, or cost per yard, or something of that kind, for the new Gas Institute. Another point I would have been interested in, if I had been doing that work would have been the conditions of the mains and of the services. I suppose the mains were probably found in just as good condition as when first put in, except for the effect of the salt water, but he had some chance to observe the deterioration. If he knew the age of his services, which it is quite possible he did not, he would have some chance to know how they had been affected.

The President—Is there any further discussion? If not, Mr. Gimper, will you reply?

Mr. Gimper—I wish to thank Mr. Greenough for what he said, because no one that has not seen the work that is being done there, can realize from my paper what we have been doing. You have no idea of the difficulties under which we have labored. I thank him very much. It is only those who have seen the thing that can have any conception of what we have had to do. In regard to the cost, I would say I purposely omitted that, because it can never be any comparison with anyone else. There are no other localities like Galveston. There is probably no other city that has the same soil to work in. I could perhaps give you a rough estimate as per block, not per foot. Now as to the condition of the mains. As I said, we found some 3-inch mains

and some 4 inch that were very poor. The iron had suffered, which caused many breaks. Where the pipe was very poor we cut it out and put in new pipe. I think it was due very much to the quality of the iron when the pipe was put in many years ago, in the older times, when we first got into the gas business, they used all kinds of stuff for making pipe. Much better pipe is made to-day than they did then. But as far as the service pipes were concerned, we have had the trouble from salt water always, so that we have had to replace them often, because our service pipes practically lie in salt water. The raising of the grade now is nothing else but salt water and sand. It has been our practice for years, ever since I have been there, 16 years and over, to use only extra strong pipe, and we have used only strictly soft wrought iron pipe. We do not use steel pipe. Steel pipe is no good in our city. For fittings we have to use brass. All our elbows and fittings that are lying in the ground are brass. We have fittings that have been in 20 years, and we can take them up and put them right back again. So we have a great deal of extra expense which you gentlemen have not. Now, raising of those mains was simply this: We opened a long ditch, part of it to only half the depth that the other part was to be opened, and then we went down to our main so as to get that as quickly as possible, and then opened the other part. We started to dig where we had the least sand, and worked from there back, down on 15th street, 14th street, and so on, as you can see on the map, and are working back as the grading is going on. The contractors have had many difficulties. They lost one of their dredges in the Irish channel. Another dredge had to be returned, it would not stand to the work; all were new dredges built for the purpose; there was some defect in it. There is another dredge on the water now, and when that arrives we will have 5 dredges. They are hopper dredges. They go by the canal into the Bay, and pick up their load, and go by the canal to their unloading stations, drop the load into the canal, and dump it then into the territory. On 25th street we have a double line of mains, and during the filling of that territory, from Avenue M south, no leaks at all occurred in the mains. But after that part of the territory was filled and the work extended further north, towards Broadway, the contractors laid a 40-inch discharge main right on top of our gas main that had been raised. That main was laid with cement joints, and stood on 4×4's. After they had been pumping a little while a leak occurred which showed itself at our pumping station near by there, and the leak increased from day to day. Of course it was impossible for us to do anything to find the leak with that big main lying over us, all the ground being quicksand, so we had to keep a man pumping. The man is pumping there yet, and he has been pumping for 3 weeks, so as to keep the line open day and night. From 5 o'clock in the morning till 10 o'clock at night we keep the man pumping there steadily. When the dredges unload, the water increases in our main; a leak in the discharge pipe furnishes the water to our pumping station. When they go to pick up another load—and it will take them 6 hours to get a load and discharge it—then the leakage decreases. So we have a fairly good idea where to look for a leak hereafter if the discharge pipe gets away and water recedes below our main, or nearly so. We have had occasion to lay new services. People have been urging us to give them gas, and we undertook and tried to do our best to give it to them. I had a cylinder built 5 feet 6 inches in diameter, 3 feet deep. We go down as far as the sand will hold up without caving. Then we sink that cylinder down to our mains, and work inside of that. Everything comes in the bottom; floods right into it. In that way I have succeeded in several instances in putting in a service pipe. In one case that I have mentioned, where a discharge pipe from the dredge had undermined our main, we went down to it and tapped a hole in it, and put a suction pipe into it, and pumped it, and cleared the main. We have done everything we could to keep up the supply of gas, and the people have appreciated it. They have been very reasonable with us. They have seen that we spared no expense in trying to supply them. This is all I have to say.

The President—I have pleasure in extending the thanks of the Association to Mr. Gimper for his paper. The paper next in order is

THE RELATIONS BETWEEN GAS COMPANIES AND THEIR EMPLOYEES,

by Mr. J. M. Berkley, of Los Angeles, Cal. Mr. Berkley unfortunately is not present at the meeting, but advance copies of the paper have been distributed to the members.

We know of no subject to-day in which there is so much involved and which has been so thoroughly discussed as has the question of the relation between employer and employee.

At this particular time this question is brought clearer and more forcibly to the minds and attention of the people than ever before, and of necessity it has reached the point where public opinion or sentiment is weighing down so heavily upon it that an adjustment along some satisfactory lines must soon be evolved, or the industrial fabric of our nation will be gored by socialistic and other destroying influences that its complete effect will be so apparent and its cries will come up so loud that something will surely intervene to make what now seems an unsatisfactory condition more satisfactory.

There is one fundamental principle underlying the whole of this question that has at times been lost sight of, but the signs of the times at present seem to indicate that this condition, so long neglected, will be forced to the forefront, and men in high positions as well as men in low will be forced to acknowledge as never before the adaptability of the Golden Rule. And right here permit me to say that I honestly believe that there is no subject entering into the welfare of the commonwealth that has been so distorted and abused as has the question of doing right unto others, especially when referred to as in the Golden Rule. There labors in the minds of a great many men the idea that to comply with the Golden Rule means they must belong to some apostolic church, pay for a sitting, be a regular attendant, and, in fact, assume the cloak of the church. Shame it is to the men who cannot see the difference between doing right for right's sake and doing right for the sake of appearance. We cannot and never will get away from the irrevocable law of doing right because it is right to all men in all of our dealings. This subject, as it affects the gas business, is akin to the great industrial family with all its attendant advantages and disadvantages.

There never has been a time in the history of our country when the gas business has been so prosperous as it is now. Our business has grown from that of infancy to one of the greatest importance in the commercial life. Its progress was slow from its inception to the birth of electricity, and, like great developments, it has come up through opposition. I believe we to-day owe more to the birth of electricity than we do to our own efforts, for when we were confronted with a commercial opponent our craft put on the best helmet it could, set its inventive ingenuity to work, contrived means and adopted appliances that would check the enemy from commercial invasion. At the same time the resistance offered created in the breast of the invader new ideas, which in turn reacted upon the gas industry and forced it to find new fields to conquer with the certainty of financial gain.

This counter-battle has gone on to the extent of not only developing each of the respective businesses, but it has developed along with it brain and brawn, such as no other public utility can show in array against it. What was once considered good practice is now entirely obsolete. The man who could control a small gas works in a large city cannot now control a larger gas works in a smaller city. The result of this condition of affairs in its prosecution for financial gain and to fill a public necessity has brought about with it a condition socially that of necessity must be associated with it.

If you will look back only a few short years and see the mighty rise that has taken place among our craft, due, of course, to the commercial march towards success, you will be surprised when you line up the names of the men, the positions they occupy and the aggregate finances for which they stand. Compare alongside of that, if you will, the methods once considered wholly sufficient for the operation of our business, and the identity of the man who once thoroughly understood the then conditions would be at this day absolutely lost sight of.

The success of the gas undertaking to-day depends upon no one or two individuals of any company, but it has its ultimate success in all men connected therewith—from the president down to the man who digs the ditch. The president of any gas company who thinks that his whole duty lies solely in the fathering of the financial end of the institution after the money has been turned into the treasurer of the company, is as sadly mistaken as the man who digs the ditch and thinks the work will stop if he lay down his tools; the positions are dependent if not the holders. For there is a social thread passing through any organization of capital and men which if rightly interwoven will so thoroughly form a web of strength that it is a social impossibility for interlopers to get a foothold with objectionable features that so often enter into the affairs of administration.

Labor troubles do not always find their birth in the sphere of wages and hours, but in a great many cases are directly traceable to conditions brought about through arrogancy and misconception on the part of officials in authority, and as weeds grow in neglected places, so does discontent in man, and the discontented man always hunts for company and support, which he usually finds in the ranks of his fellow workmen.

It requires more diplomacy on the part of the officials to properly handle the men under them than it does to manage their finances. A

manager or superintendent who thinks by virtue of his position he can say to this man, "Go," and he will be gone because of some intimation that he may have received of his failures, without inquiring into the facts, will find that in his hasty action he has sown more trouble for his company than he can properly adjust in a year. The influence of employees to-day is so closely identified with public sentiment that it can not be disregarded. The reason for all this is the socialistic tendency of the age. Public utility companies serving a general public, drawing their support from its channels, have become an integral part of society, as well as finances. The man occupying the humblest position in the company has not only his followers in the employees of the company, but in his neighborhood. The man a little bit higher has likewise his influence which will extend farther into the neighborhood, and the man who is employed in the office and comes directly in contact with the public has an influence that extends still farther. The fact that any of these men may make a failure in some one instance is not always a justification for a discharge. Investigation will always pay.

It is as true as an axiom that no company serving the public can serve the same acceptably and gain financially with continued results unless there is harmony in the ranks of the employees. The manager or superintendent who has in his make-up the quality of getting the hearts of the men is to-day the only successful managing director of the working forces of any company, for in them is born the balance side of the ledger.

We do not to-day provide for the employees of companies the proper training and social intercourse among themselves, brought about directly through the officials of the company. Any gas company employing five or ten men can effectually introduce into its organization an influence that will count for the success of the company, and that costs but very little money and yields the greatest return of any money spent by the company for any purpose whatever. All men desire recognition, and the man who abuses it is easily found out. I do not wish to be understood as advocating a charity feature or in any way giving something for nothing, but, on the other hand, employees can be made to feel and understand, for they are men of feeling and understanding, that the company's interest is in the men.

There are various ways of introducing social features entirely along educational lines that are very effective. We can refer with great satisfaction to a new and effective organization in the company with which I am at present connected. Eight years ago they had but few employees, numbering less than fifty; now they number up into the hundreds, and over these hundreds are placed foremen whose business is that of the usual foreman, but each foreman is given to understand that fair dealing must be and is the rule.

At an interval of about every three months the foremen of the gas and electric departments, numbering about 60 men, are brought into the general office, where a meeting is held along the same lines as are the meetings of our organization, the company bearing all the expenses incident thereto. At the same time there is interwoven into the fabric a distinct and discernable feeling that our company is not spending its money without a definite expectancy of returns. These men are better fitted for their duties by these meetings as a result of the educational features. They are socially made acquainted through the little banquet furnished by the company. The result of all this is, as it must be wherever practiced, that these men go away swearing allegiance to the interest of the company, defending its rights, working out its principles, and consequently adding to its ultimate financial success.

The general superintendent of our company, being a man of such high principles and integrity, accords to every man employed by the company a hearing, to which I believe all men are entitled, as there are apt to be little personalities creep into the direction of affairs through the foremen and assistant superintendents, that it makes this necessary. We can truly say, without question, that the company owns the hearts of the men it employs, as well as their time; therefore labor troubles are unknown.

What I have stated of this company is just as true of the small company employing but a few men, as it is of this. The great trouble is in small companies they are too busy with the pennies, allowing the pounds to go to waste, failing to develop the relation existing between themselves and that of their employees. This is very liable to creep into syndicate ownership, yet, if properly directed, the greatest influence for good may come; but on the other hand, if not, they are at once classed by the citizen as a foreign corporation, working for greed and gain only and the man in the street, and the man in the retort house may become so indifferent, as to neglect purposely his work to the extent of intended loss to the company.

I think if we would stop to consider the interest of the employees of the gas company, and especially those who work 365 days in the year, who have no seventh day of rest, whose night is day and day is night, and show to those men that we are directly interested in them, for the man who will not stand good treatment is not worthy of employment —I contend from experience, that strikes would be unknown, labor discussion disappear and a feeling akin to that of mutual interest will be the result in almost every case. I advocate spending money along such lines, because bettering the physical condition of the manufacturing plant, results in the personal welfare of the employees. How can the stoker who has no place in which to change his clothes, or to take a bath and is provided with poor equipment, as many of us are aware is a fact, be expected to get the most value per ton of coal on the balance side of the ledger as far as his connection therewith goes? How can the man in the street, who likewise is expected to excavate macadam streets with poor tools, and the fitter who is not provided with proper fittings and the necessary equipment to properly do his work, help but become dissatisfied? And the man in the office who through the curtailment of expenses is made to do 2 men's work would likewise become dissatisfied, and it brings itself up to the question of mismanagement somewhere, along the line directly chargeable to the managing forces and the president of the company.

Therefore, as I said in the beginning, the president who thinks that his whole duty lies in finances, can find his influence for good in the physical direction of affairs if he so will.

Men are not naturally born with a spirit of unfairness, whether they be employer or employee, but this breach is often the result of failure on the part of one or both, to squarely understand the situation. Each is apt to grow into a state of mental independence. It is a fog of the mind, for when the same is lifted by time in deliberation, we usually find our failure.

There is no ground for becoming alarmed in considering the best interest of the employee, and in his knowing it, for if it spoils him it is the quickest and cheapest way to find that you do not need him and gives the employer the best opportunity to rid himself of him, and at the same time strengthens the confidence of other employees that only fairness in return will be accepted.

Therefore I am quite sure that the relation between employer and employee can be very materially simplified if there is a better mutual understanding, which is manhood personified on the part of both.

The employee owes his first duty to his employer for the privilege of employment, for without remuneration for his labor he would be a public mendicant; likewise the employer owes a duty to the employee for being able to expand his resources, without which he himself would soon stand in the same place as the employee.

Discussion.

The President—The subject is now open for discussion. We have had a lecture on this subject by Dr. Tolman. Do you care to say something on this, Mr. Greenough?

Mr. Greenough—I did not hear which one.

The President—The paper on The Relations Between Gas Companies and their Employees.

Mr. Greenough—No, sir; I have strong views on the subject which I don't care to state. No, I guess I won't.

The President—Colonel Pratt, do you care to say something on this paper, in view of your experience with profit sharing in Milwaukee?

Mr. E. G. Pratt—I have not read the paper, Mr. President. I don't know whether I should find myself in agreement with the lines advanced there. So far as profit sharing is concerned, and the experience that I have had with it, I think that experience has not been altogether as satisfactory as I had hoped for before I became interested in it. It may be that the plan which Milwaukee has in vogue is not the best plan, but I think it was the one decided upon after very careful thought and very careful study of the question. The plan there, in brief, is something like this: After persons have been in the employ of the company for a year, the first 6 months after the first year, if they have been constantly engaged in their work, they are to receive from the company the same percentage upon their salaries, or their wages, as is paid to the stockholders in dividends. That has not always been adhered to, however, for the bonus percentage paid to employees has at times exceeded the dividend percentage paid to the stockholders. For instance, when the company felt that they had had a particularly good and profitable year, they would advance the percentage, or the bonus paid, to employees. That bonus has amounted to as high as 10 per cent. upon the wages of the men. I think in many instances that the bonus profit sharing scheme is appreciated by the men. I think in

many instances, however, it is looked upon by the men as a part of the compensation that they were really entitled to, but that in their short sightedness. I think, however, the ones who really do appreciate this bonus are the wives of the employees. In many instances the wives seem to be interested to come and collect that bonus for the men, and it is very gratifying and very satisfying to us when it is done in that sort of way, because we feel that it is in the right place. But leaving aside the thoughts sometimes that come to us that such action on the part of the company is not appreciated, for the reason that men in discussing these things among themselves say, "Well, that is only what we were entitled to, and we ought to have had it any way," I don't suppose there is any way by which such expressions of ingratitude can be obviated—it is very satisfactory, as far as the standing in the community which it gives to a company doing that sort of thing is concerned. In my judgment, it is very great. I feel that the company can really afford to do it and in the main, I would dislike to recede from some such plan. In the aggregate, with a large company, it does not amount to so very much, and upon the whole I think it gives satisfaction, and those who are satisfied, and those who do appreciate it, possibly, offset and compensate for those who do not.

The President—Mr. Chamberlain, will you say a word, please, for Grand Rapids, about the profit sharing plan there?

Mr. Chamberlain—The employees' profit sharing plan at Grand Rapids is very similar to the one that has just been described by Mr. Pratt; I think exactly the same, if I heard it correctly. The plan was put into effect in Grand Rapids in 1899. I think the method is a very good one. I know that it furnishes an incentive for the old employees to stay by us, and everybody seems to appreciate it very much.

The President—If there is no further discussion—

Mr. Egner—I should like to say a few words on that subject. I have had relations with working men perhaps as large as any, excepting very few, in the gas business for many years, and have read this paper with considerable attention, and what I say I do say for the benefit, perhaps, of those young men who have not had the experience and won't have for a good many years to come. Now, here is one thing in Mr. Berkley's paper to which I call attention. He said: "Labor troubles do not always find their birth in the sphere of wages and hours, but in a great many cases are directly traceable to conditions brought about through arrogancy and misconception on the part of officials in authority." I have found that many times to be the case. I think that sometimes the superintendent would do well to look after his foreman, or the president after his superintendent. Here is another quotation: "The fact that any of these men may make a failure in one instance is not always a justification for a discharge. Investigation will always pay." I have found that also to be the case a number of times. I will mention one instance at the Laclede Gas Works, Station B, where one of the assistant foremen allowed an oil tank to overflow when pumping in naphtha. We were making coal gas and enriching it with naphtha, and the supply tank was allowed to overflow. The oil took fire from the coke in the cellar, and the whole thing was burning, of course, in a few seconds. In many works with which I have been connected that man would have been immediately discharged. I knew he did not do it purposely or even through carelessness. (He tried to do some other work while the pump was going.) The fire was extinguished very simply by just putting a cover on the tank, thus smothering the fire, instead of throwing water on it and spreading it all over. I took the man aside and spoke to him about it, and afterwards that man was one of the best men we had there. We never again had a fire. I should not be surprised if he was there still. He was very careful, and nothing ever happened again. I have had many similar instances, which I will not trouble you with relating. It does truly pay and is only right to investigate always, and to treat men, no matter how ignorant they may be, with fairness and even becoming courtesy. Such has been my experience in a long, active life, during which I have passed through 7 strikes of considerable magnitude, have been on the losing and on the winning side, and have viewed the subject from both sides of the question, and never made an enemy on either, or lost a dollar for my employers.

Mr. Greenough—I will say a word or two on this subject. I think circumstances alter cases very much. The quality of the labor that you have to deal with affects your views as to the desirability of profit sharing. If we had such a set of men here, for instance, working for us, as we used to have in Boston, where the men worked for the Boston Gas Company from father to son, it would be a scheme which I think might well commend itself to any manager; but in Cleveland, for instance, at the present time, practically there is such a demand for intelligent labor amongst the great number of factories of all kinds in this city, that nobody comes to work for the gas company except the most ignorant of foreign labor, men who depend on their hands for their livelihood, and that is practically all they have got. I suppose that in our larger works—well, I won't say that two-thirds of the men cannot speak English, but I do say practically all the men are known by their numbers, because their names are unpronounceable. They come here from the lowest classes of Bohemia and Austria. They stay here until they have got together a few hundred dollars, and then they go back to their native land and buy a farm and settle down. I most certainly believe in treating men well. We have arrangements at both our works for their comfort, for opportunity to keep their clothes and to wash themselves and that sort of thing. I believe in paying the men well. In times when wages were reduced in Cleveland by substantially everybody, the Cleveland Gas Company was one of the only two corporations in this city that did not reduce them. We were making money, and we could afford to pay our men, and we did. But when the time came that an appreciation of that might have been shown by the men, why, they struck without any excuse; they struck first at one works and then at the other. They have soured the milk of human kindness in my breast, as far as they are concerned, and I don't feel in the least that it would be for the advantage of the company, or that I am called upon, to present them with any bonus. Nine-tenths of them I don't care whether they stay or not. Now, there are one or two cases that have occurred here in the last few years which have a good deal disturbed the people who are interested in the opportunities to improve the welfare of the men. Look what they did at Dayton. There was Dayton, the model city of the country. There never was a place where more efforts were made than by the managers of that factory town to improve the condition of their men, to give them good houses, to give them education, to give them opportunities for benefit of every sort or kind. And then along comes a trade's union leader, and they go out like *that*. There are corporations in this city who have done everything they could for the advantage of their men, who have given them opportunities to get their meals at the lowest price, who have given rest rooms for their girls, reading rooms for the men, everything that could be done; but when strikes came here 2 or 3 years ago their men all went out just the same, without giving notice, without giving any more chance than if they had been paid $1.50 a day and had been given nothing for themselves. It is an unpleasant thing to stand up and deprecate the efforts on the part of a corporation to better its relations with its men, and yet, as I have watched the thing in this part of the country, I don't believe that so far as the relation of our corporation is concerned, or of many of the corporations in this city, it would have the slightest effect upon our connection with them whether we gave them 6 per cent. extra on their wages or not. They would go as soon as they got the money which they were saving. Pay them well. Look after their comfort. But I cannot feel that we have any of the personal relations with them which I feel that we did have with the men that I was brought up with, the Irishmen, and the Scotchmen, and the Englishmen, in the East. The condition of things I have described certainly exists in this part of the country. There you are.

The President—If there is no further discussion, I will declare it closed, and extend the thanks of the Association to Mr. Berkley for his paper. In view of the precedent established by naming a committee to continue the investigation of Mr. Miller's work, it seems to me it would be proper for us to name a Committee on Rates. It is quite probable that the American Gas Institute will conduct its plan of work largely through committees, and reports of committees will be presented at each annual meeting, so there will be a continuity of work. I think we ought to follow through the work that Mr. Gardiner has initiated at this meeting. A motion will be in order to establish a Committee on Rates. Mr. Baehr.

Mr. Baehr—I move that a Committee on Rates be appointed by the President, to consist of such number of members as he may deem requisite. (Adopted.)

The President—I will appoint as the committee Mr. Gardiner as Chairman, Mr. McLean and Mr. Doherty. The committee naturally will report to the Institute. It cannot report to this Association.

Mr. Gardiner—Mr. President, I want to say that I feel very deeply honored at being appointed the Chairman of what I think is the first Committee on Rates ever appointed by a Gas Association. The task is a very large one, as well as an honorable one. I feel almost like asking some advice from this meeting as to our plan of procedure in that committee, as its work is entirely new to the Gas Association. I should very much like to hear from the Association on that point.

The President—The Association, Mr. Gardiner, would prefer not to hamper you in your initiative. We want you to go right along on

your own original lines, and we think we are perfectly safe in putting the work in your hands. The next order of business is the

WRINKLE DEPARTMENT,

Mr. Bryce McAdam, Editor.

Mr. McAdam—Mr. President, read them by the title.

The President—Yes, that is all. The Wrinkle Department is the old standby of the Western Gas Association, and in view of the fact that the papers have been distributed in advance I will suggest that the Wrinkles be read by title only. If there are any questions that members would like to ask, I am sure that Mr. McAdam is prepared to answer them. Mr. McAdam will read his introduction.

Mr. President and Gentlemen of the Western Gas Association: In presenting the work of this department to you, I feel as if an apology should accompany it, from the fact that it does not, in my opinion, come up to the standard set by my predecessors. In editing this work, I have accepted everything as a wrinkle that could prove useful or instructive to any degree, and have attempted to add to the field by my invasion of the British gas companies. Some of the letters which accompany wrinkles from English companies I give in full showing the friendly feeling with which my requests were accepted. I wish to thank all those who were kind enough to assist in this work, and especially those gentlemen on the other side who contributed such valuable items.

No. 1.—*Retort House Governors and Method of Handling Holder Valves.*—Mr. B. McAdam, Editor Wrinkle Department, Western Gas Association, Milwaukee, Wis, U. S. A.—Dear Sir: From your letter I gather that there are still a few of your countrymen, left who recognize that there may be something worth knowing about gas supply in this "obsolete" old country. My own opinion is that we may be mutually benefited in business methods and technical practice by encouraging sympathetic relationships and by correspondence such as you are responsible for.

In public gas supply, as in most other public services, its value to the consumer is enhanced by constancy in quality and reliability in pressure, volume, etc.

My practice here in two departments has commended itself to those gas engineers who have visited these works and you may possibly regard my short description as "wrinkles" for American readers.

In this country part of modern retort house practice, has been in the direction of reduced hydraulic seals, or the abolition of seals, and the use of dry valves in the bridge pipes, the object being to reduce pressure within the retorts during distillation and thereby to increase the production of gases distilled from the coal. In either case, light seals or no hydraulic seal, increased risks are incurred of drawing in air and furnace gases by imperfect exhausting and the quality of the gas is likely to vary considerably.

To avoid this risk and yet to allow of the lightest seals or no seals being used, I have interposed a governor between the exhauster and the foul mains on the retort bench. In my case the governors are fixed in a building adjoining the retort house, while the exhausters are fixed at a considerable distance. See Fig. 1, showing arrangement of two governors. The sheet from the pressure recorder which I inclose shows with what perfection the exhaust on the foul mains may be maintained. See Fig. No. 2.

The second possible wrinkle I would suggest is the arrangement of inlet and outlet valves for operating the gasholders as shown on Figs. 3 and 4. By this arrangement it is hardly possible for the operator to make a mistake, and even if all the outlet valves were closed, the safety governor would come into use and keep up the supply to the city.

The grouping of the valves within the governor and meter house enables the operation of changing holders to be done with exactitude. One pipe only is used alternately as inlet and outlet to each holder. If the holders are any distance apart the cost of grouping the valves is very much reduced by the use of one pipe instead of two.—THOMAS GLOVER, Norwich, England.

SALISBURY, ENG., November 29, 1905.

Mr. B. McAdam, Wrinkle Department, Western Gas Association—Dear Sir: In reply to yours dated August 1st, I have pleasure in sending a few notes and trust they may be acceptable to your purpose. Yours faihtfully—N. H. HUMPHRYS.

No. 2.—*Preventing Shutting off Town Supply by Inadvertence.*—Some years ago, while traveling on a single gauge railway, I noticed what is called the "staff" system in use. The driver of the train must not proceed until he has received the "staff" from the proper official. As there is only one staff there can be only one train at a time running

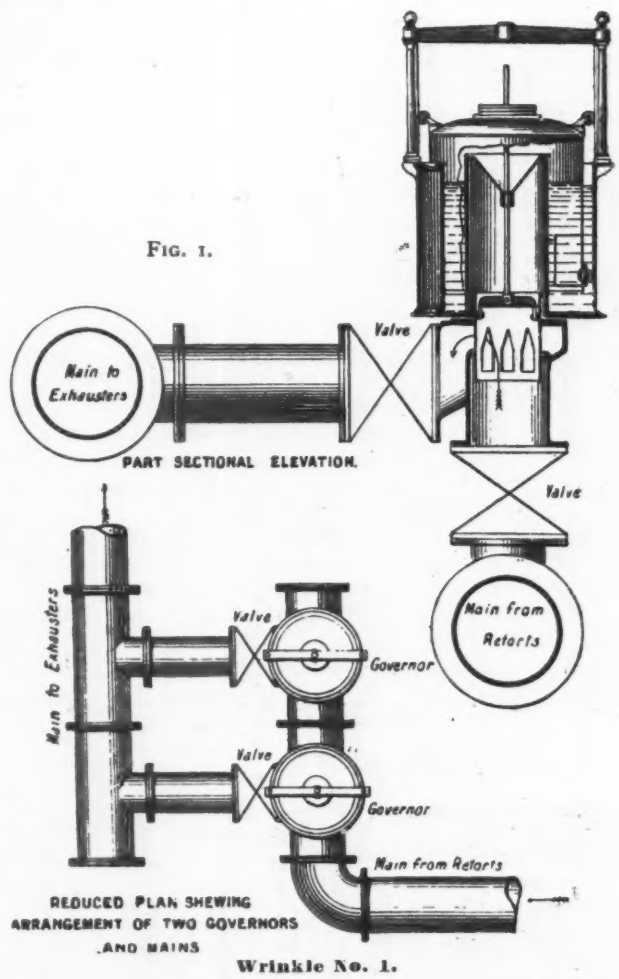


FIG. 1.

Wrinkle No. 1.

on the section. It occurred to me that the system might be applied to the holder valves. Accordingly a "staff" was prepared in the form of a board about 12×9 inches, painted black, and bearing an inscription in white letters. "This board must always be hanging on an open outlet valve." A suitable hook is provided and when the valve man wishes to make a change he *must* first open a second outlet to provide an open valve for the board to hang on. This plan has proved satisfactory over fifteen years. A similar board is provided for the inlet valves.—N. H. HUMPHRYS, Salisbury, England.

No. 3.—*Identifying Heaps of Oxide.*—For years it has been my object to keep a history of each parcel of oxide of iron used for purification, showing when it is put in, when thrown out, and particulars of gas passed. To identify each particular lot a distinctive letter is assigned to it. Labels consisting of a small piece of board mounted on a wooden spike about a foot long are used. A letter is boldly burned into the wood with a red hot iron. The reason for adopting this in preference to painted letters was because paint so soon tarnishes that the letters became indistinct. There is a staple provided in a suitable position on the side of each purifier, and when a heap of oxide is put in the distinctive letter is put in the staple. Thus it is possible to locate the exact position at any time. For example, to day it is as follows:

Heap A	in	No. 1 box.
Heap B	"	2 "
Heap C	"	1 revivifying shed.
Heap D	"	2 " "
Heap E	"	3 box.
Heap F	"	1 house.
Heap G	"	4 box.

The quality of gas that has passed through each heap being known, also the percentage of sulphur, the winter season can be faced without the risk of one or more heaps being found to be used out, just at the busy time.—N. H. HUMPHRYS, Salisbury, England.

No. 4.—*Comparing Burners on Photometer.*—One frequently needs to compare two or more different kinds of burners on the photometer, or to test one against the other. In order to avoid loss of time in changing, I adopted the following arrangement which was designed by the late Prof. Foster: The upright pipe *A* carries a ground conical plug, similar to the plug of a tap, but drilled with one outlet only at the side, as shown and that facing the sight line on the photometer.

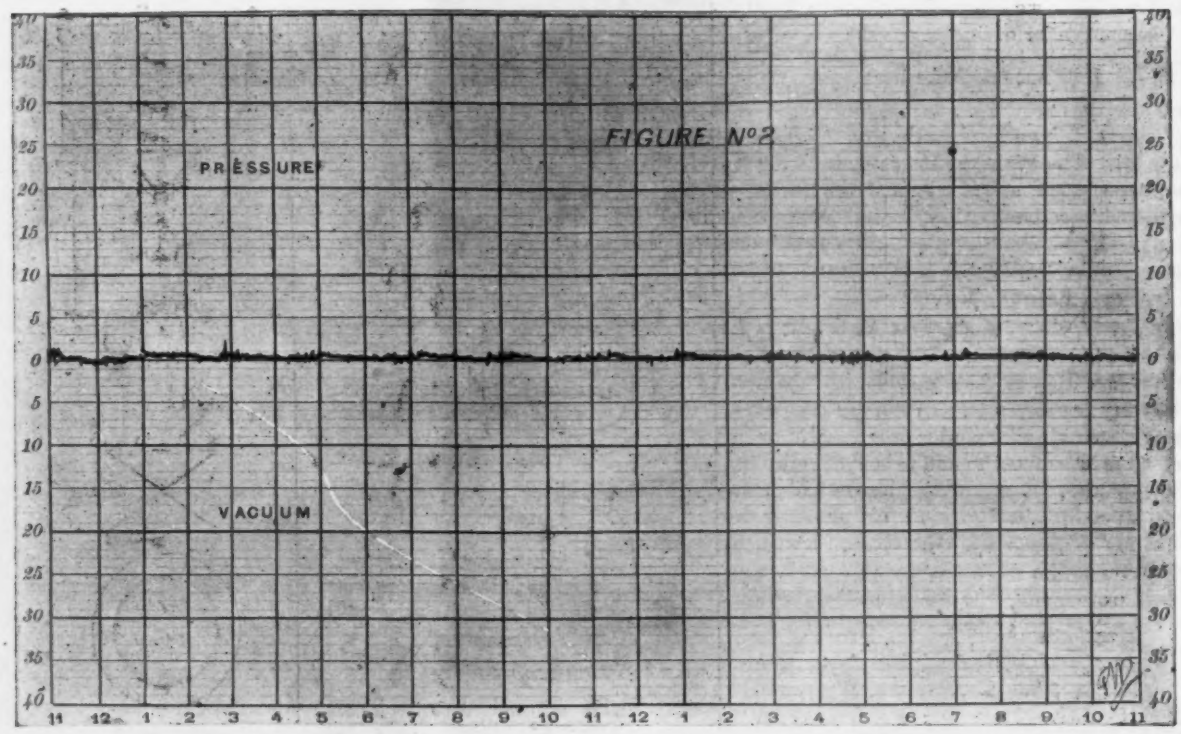


FIGURE N°3

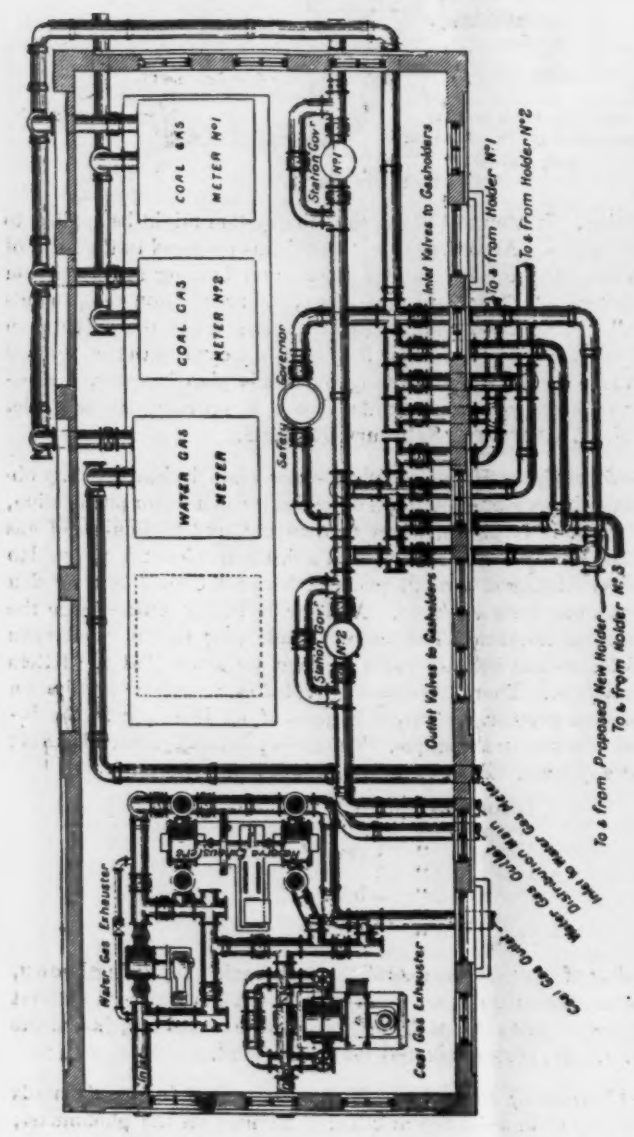


FIGURE No. 4.

Wrinkle No. 1.

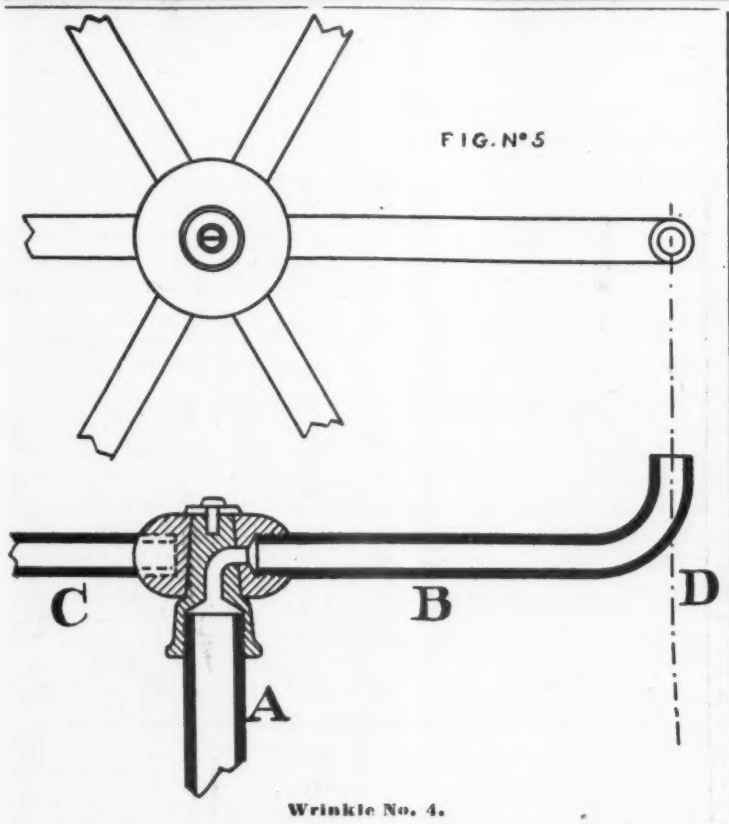
B, may register correctly with the plumb bobs shown by the dotted line.

Figure No. 5: *D*, By simple rotation any arm can be brought into the testing position *B*, And it is only the arm in that position that receives a supply of gas, the others being shut off.

Another useful feature in connection with this arrangement is a 10 or 15 cubic feet gasholder to insure the supply of an even quality of gas over a series of tests.—N. H. HUMPHRYS, Salisbury, England.

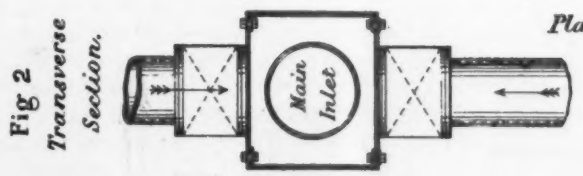
No. 5.—Bryce McAdam, Esq., Editor Wrinkle Department, Western Gas Association, Milwaukee, Wis.—Dear Sir: Your letter is to hand. As you will know, there are many little things one has to devise

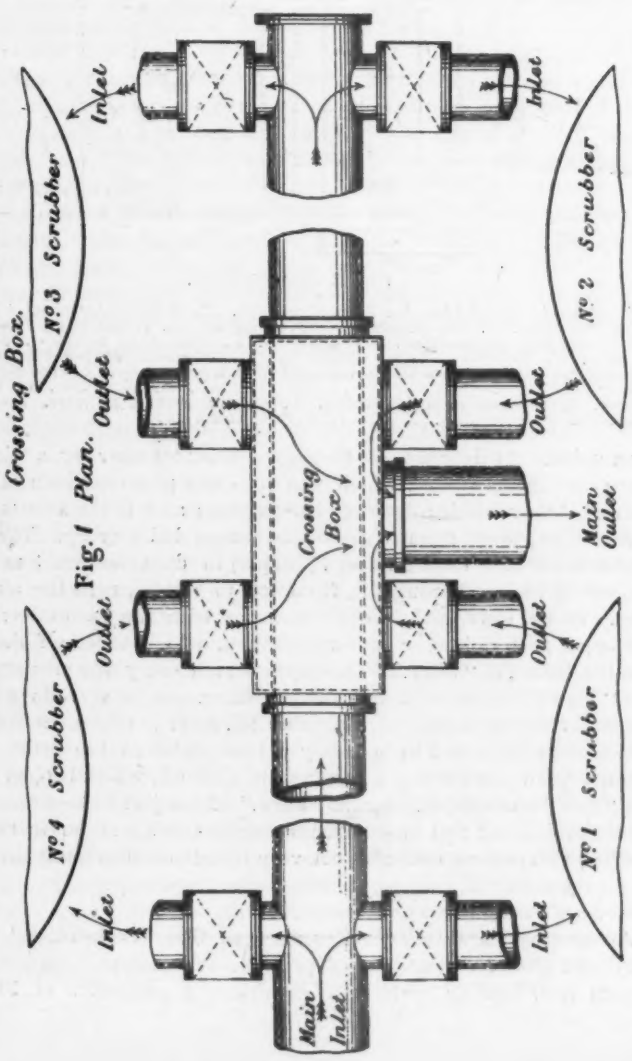
On this is fitted and ground gastight, a hollow boss or body, with the usual washer and tightening screw, and a convenient number of branches, *B*, *C*, are attached to it equidistantly, care being taken that they are each of equal length so that each one when brought into position, in connection with the construction of gas works which are scarcely worth magnifying into a subject for special mention. At the moment I can only think of sending you a copy of a paper read before the Institution of Mechanical Engineers in 1896, in which is referred to and



Wrinkle No. 4.

Plate N°6

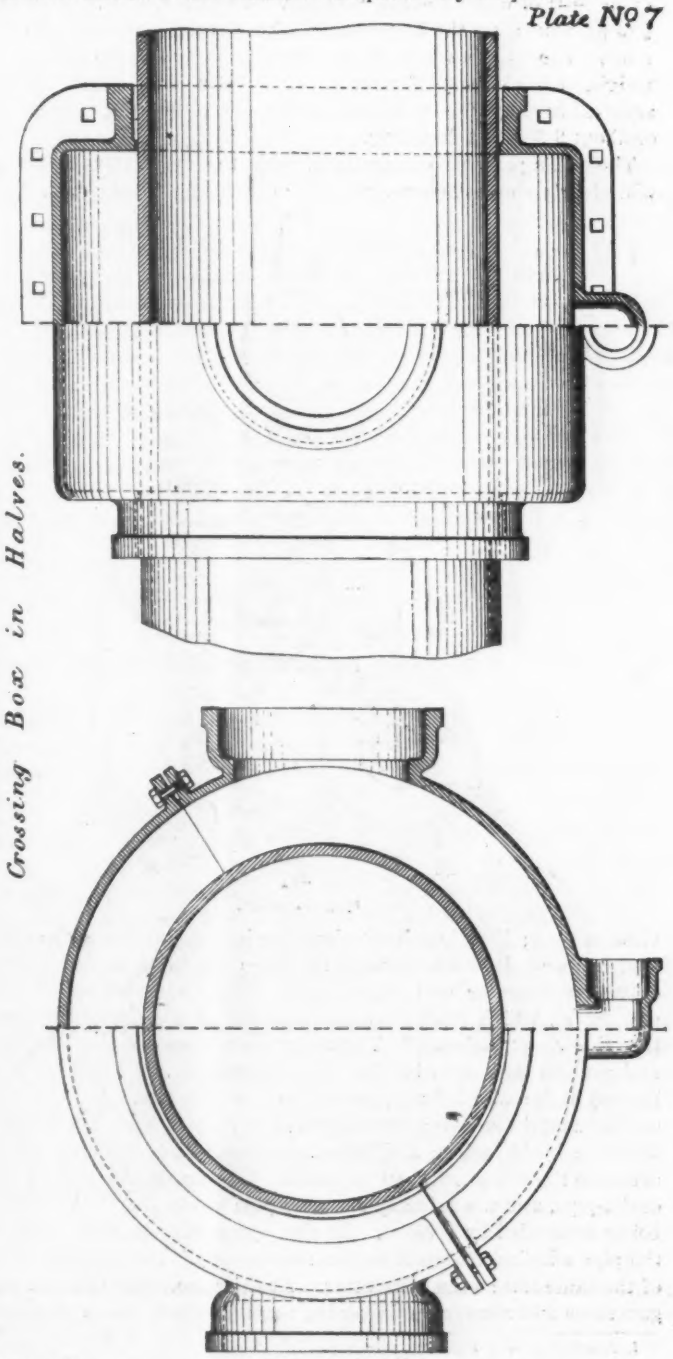




illustrated a method I designed to get us out of a difficulty of arranging inlet and outlet connections of a set of 4 scrubbers. This and the modification of it also referred to and described herein have gotten me out of many difficulties. I know that one or two of my friends have adopted this in their latter construction, and perhaps it is now a matter of general notoriety, but on the off chance I send it, and if it is not new you will know how to dispose of it. If anything else should occur to me later I shall be pleased to communicate with you. Meanwhile believe me. Yours faithfully—JAMES STELFOX.

Article Referred to in Mr. Stelfox's Letter.—In bringing up the establishment to its present producing power, it will be readily understood that the connections both over and underground formed no small part of the difficulties to be overcome. The pipes were becoming not only more numerous, but also larger; the former connections, of which the largest did not exceed 12 inches diameter, had to be replaced by sizes increasing from 18 to 36 inches. The lines too, had to cross frequently, necessitating great depths of excavations of mains, and rendering the draining of the latter difficult. About 1865, when a problem of special difficulty presented itself, the writer was fortunate enough to hit upon a simple plan for accomplishing the desired end. Fig. 1, Plate 6, shows in plan the position of the scrubbers, and the method of their connection with the main. While the inlet pipe is connected in the ordinary way to the scrubbers, it will be observed that the outlets from the latter pass into a box of square section, Fig. 2, Plate 6, which surrounds the inlet; and it is from this box that the main outlet issues. So useful did this method prove, that advantage was soon taken of it in a modified form for the crossing of existing mains, by constructing a crossing box in halves, as shown in Plate 7, with flanges set at an angle from the horizontal line, so as to form room for the inlet and outlet sockets, and for a drip outlet at bottom. The latest of these crossing boxes have been fixed in the connections from the water gas extension, which have therefore been rendered comparatively simple.

Plate N° 7



Wrinkle No. .

(To be Continued.)

Report on the Kramers and Aarts Water Gas Plant at Zevenbergen Gas Works.[1]

Before Dr. A. Steger read his paper, on the Kramers and Aarts water gas system, at the annual meeting of the Société Technique du Gas, the Secretary of the Society (M. Payet) very briefly referred to his report on tests which he, in conjunction with others, had made upon the plant installed at the Zevenbergen Gas Works. From this report, we take the following particulars:

The trials originated in the submission by the firm of MM. J. & O. G. Pierson (who are the representatives in France of the Kramers and Aarts system) of a producer on this system in one of the annual competitions of the Société Technique. The tests took place on May 2, 3 and 4 of this year. There were present Dr. Steger, the Manager of the Kramers and Aarts Company, M. Hartman, their Chemist, M. Pierson, of Paris, and M. Payet, delegated by the Société Technique du Gaz. Zevenbergen is a little place on the borders of Holland and Belgium. Its gas works have two sets of water gas plant, upon one of which the tests were carried out; its nominal capacity being 50 cubic meters (1,766 cubic feet) per hour.

The plant was started in May, 1904; and it only works during the day. The water gas made is sent along into the coal gas retorts; means being provided for the self-enrichment of the gas in normal working. From a note at the end of the report, we learn that the leading of the water gas to the bottom of the retort is effected by a wrought iron tube 75 mm. (3 inches) diameter. It is controlled by a tap which can be manipulated from the front of the bench. Abut 10 cubic meters (350 cubic feet) of water gas are mixed with each charge. It is put in a ¼ of an hour after the beginning of the charge, and lasts for ¾ of an hour. The charges are made every four hours; each being of the weight of 130 kilos. (287 pounds), or a little over 2½cwt. The retorts are oval in shape, 520 mm. (20½ inches by 15 inches), and 2.80 meters, or about 9 feet 2 inches long.

The accompanying illustrations, with the descriptive lines at foot, will clearly show the arrangement of the apparatus. Fig. 1 gives a

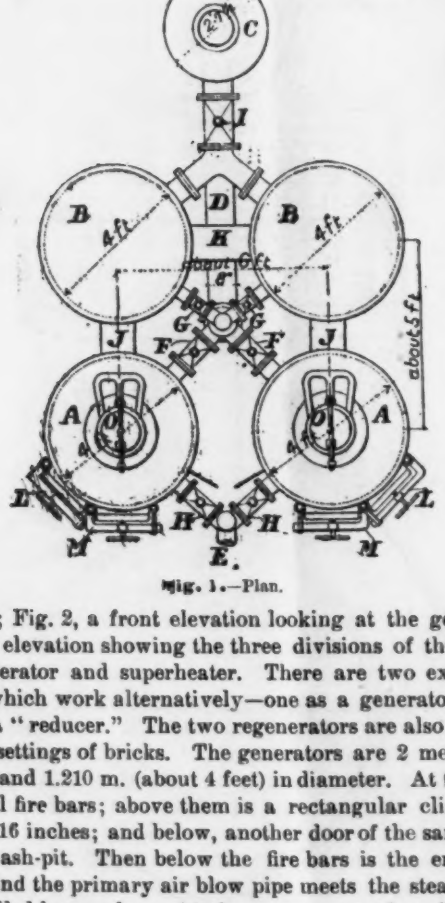


Fig. 1.—Plan.

view in plan; Fig. 2, a front elevation looking at the generator; and Fig. 3, a side elevation showing the three divisions of the plant—generator, regenerator and superheater. There are two exactly similar generators, which work alternatively—one as a generator proper, and the other as a "reducer." The two regenerators are also exactly alike and contain settings of bricks. The generators are 2 meters (6 feet 6¾ inches) high and 1.210 m. (about 4 feet) in diameter. At the lower part are horizontal fire bars; above them is a rectangular clinkering door, 10 inches by 16 inches; and below, another door of the same size giving access to the ash-pit. Then below the fire bars is the end of the gas outlet-pipe, and the primary air blow pipe meets the steam blast; each being controlled by a valve. At the upper part of each generator is the pipe which connects it to the regenerator. These regenerators are of the same size as the generators. At their top. they connect with the generator and receive the incoming secondary air, which is controlled

1. *Journal of Gas Lighting.*

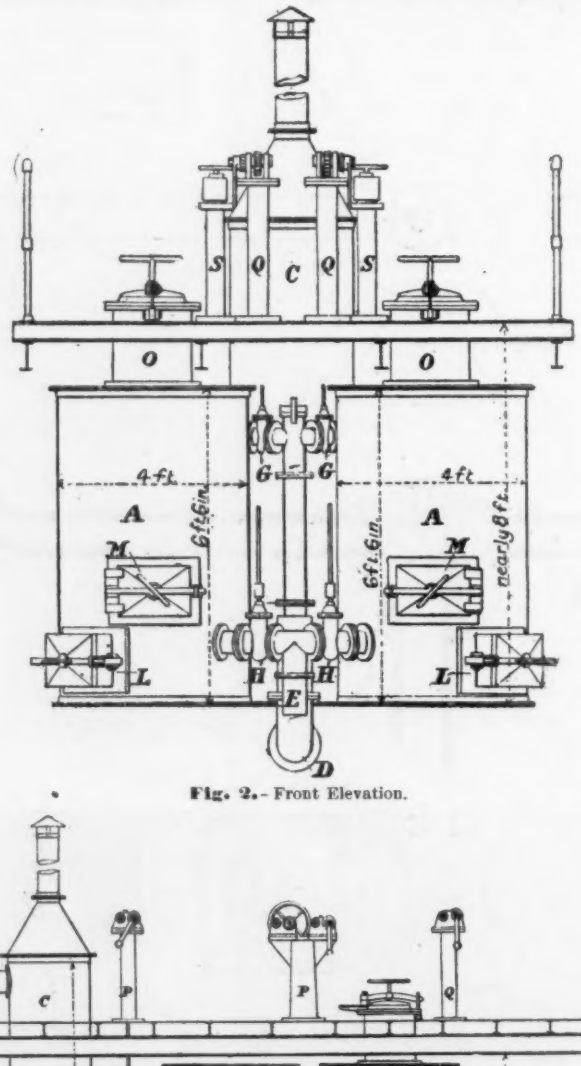


Fig. 2.—Front Elevation.

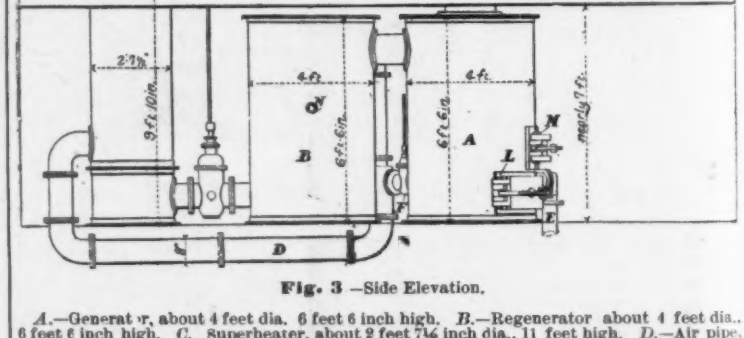


Fig. 3.—Side Elevation.

A.—Generator, about 4 feet dia. 6 feet 6 inch high. *B.*—Regenerator about 4 feet dia., 6 feet 6 inch high. *C.* Superheater, about 2 feet 7½ inch dia., 11 feet high. *D.*—Air pipe, about 8 inch dia. *E.*—Gas pipe, about 4 inch dia. *F.*—Primary air valve. *G.*—Secondary air valve. *H.*—Gas valve. *I.*—Superheater valve. *J.*—Connection between generator and regenertor. *K.*—Connection between regenerator and regenerator. *L.*—Ash-pit door, 10 inch by 16-inch. *M.*—Clinkering door, 10-inch by 16-inch. *N.*—Sight hole. *O.*—Charging hopper. *P.*—Gear for working air valves. *Q.*—Gear for working gas valve. *R.*—Gear for working superheater valve. *S.*—Gear for working steam cock.

by a valve. At their bottom, they are joined together by a pipe, and there are the gas outlets, which run into one pipe on which is fixed a valve. An oval hole allows of cleaning out; and the inside temperature can be judged from a sight-hole placed halfway up. The superheater is 800 mm. (about 2 feet 7½ inches) in diameter and 3 m. (9 feet 10 inches) high. Through it, from top to bottom, runs the air blow-pipe. At the lower end, it communicates with the gas outlet; and at the upper part, it finishes with a chimney, which takes off the gases coming from the "blow." The pipes which carry the primary air of the "blow" into the bottom of the generator, and the secondary air into the top of the regenerators, are horizontal, and run into a vertical main closed at its upper end by a safety valve. Between the primary and secondary air pipes is a small automatic blow-off, which is open during the "run" and shut during the "blow." Its object is to clear out the combustible gases that might accumulate in the air main, if the controlling valves were not tight. A very simple and automatic throwing-in gear prevents any wrong manipulation, and especially any unexpected air during the time of manufacture.

Accessory apparatus at the Zevenbergen Gas Works consists of: A vertical boiler of 5 atmospheres' pressure and 3 square meters (32.29 square feet) heating surface; a scrubber; a gasholder of 50 cubic

meters (1,766 cubic feet) capacity, which receives the gas immediately after leaving the scrubber; a meter of 100 cubic meters (3,532 cubic feet) per hour, through which the gas passes before being distributed for self-enrichment; and, lastly, a blower driven by a 7-horse power Crossley gas engine, which is also used for working the pumps and exhauster.

The operations for gas making are as follows: (1) A "blow" of 40 seconds with air; (2) a "blow" of 5 seconds with steam, in order to sweep away the last traces of air (for these two "blows," the two generators and the two regenerators work in parallel into the superheater and exhaust chimney); (3) a "run" with steam lasting about 5 minutes. During this operation the two generators and regenerators all work one after the other.

According to the inventors' theory, the formation of gas during the "run" is the result of the following successive operations: (1) The passing of steam through the first generator produces a mixture of CO_2, of CO, and of undecomposed steam; (2) this mixture becomes wholly transformed in the regenerators into H and CO_2, in consequence of the splitting-up of the steam and the combustion of CO; (3) lastly, during the passing of the gas through the second generator, the CO_2 is definitely reduced, so that the final gas mixture is almost entirely composed of hydrogen and carbonic oxide. The two generators work alternatively as actual generators and as a "reducer."

The tests included an inspection of the apparatus, a starting in action, a test of consumption, the measuring of the air used during a "blow," and, lastly, laboratory experiments. These were carried out both on pure water gas and on mixed gas following upon self-enrichment. They were done in the well-equipped gas works' laboratory, and consisted in ascertaining the calorific power of the gas by means of a Junkers calorimeter; analyzing the gas made and measuring the lighting power of the mixed gas only. From the moment of first starting a first on the fire bars (using quenched coke) until the time that good gas was being made, was a period of 1 hour 40 minutes. Gas mixed with 20 per cent. of water gas gave averages of calorific power of 5,687 and 5,658 calories at standard temperature and barometric pressure. Analyses of the gas gave the following percentage results:

Carbonic acid (CO_2)	0.3	0.3	0.3
Oxygen (O)	0.2	0.2	0.2
Ethylene (C_2H_4)	3.5	3.5	3.5
Carbonic oxide (CO)	13.2	13.2	13.2
Marsh gas (CH_4)	28.9	24.8	22.0
Hydrogen (H)	46.3	55.4	57.9
Nitrogen (N)	7.6	2.6	2.9

Messrs. Pierson suggested that it would be useful to make a prolonged test of consumption, so that drawbacks due to the necessities of manufacture, as well as to those arising from the formation of cinders and clinker, might be included with certainty in the results obtained. This would undoubtedly have led to less favorable results than those of a few hours' test, and would give a more exact idea of the value of the apparatus. But, besides the question of supervision, it is to be remembered that many water gas plants, and in particular that at Zevenbergen, are necessarily intended to work intermittently. So in agreement with Messrs. Pierson and Dr. Steger, we had a trial extending to 10 hours only, commenceing at any moment in normal working. There is also the question of taking into account the clinker and ash produced. But we decided that, to be practical, such amount could only be exactly ascertained after knowing the quantity of fuel used during the test, and after the proportion of ash in the fuel had been found out by analysis. So, as many other plants have had their figures of consumption stated without calculating the residue, we thought that it would not be fair to treat the apparatus a Zevenbergen in any different way; and we therefore give the results obtained by us under the same conditions. The number of runs was 96. A small gasholder of 5 cubic meters capacity (176 cubic feet) was connected during the test with the water gas holder, so that it continuously received a small proportion of the make, which might be regarded as an average sample of the total gas made. It was upon this gas that the laboratory tests were made. The following are the results that were obtained:

(1.) *Coke Used.*—The generators were filled at the beginning and at the end of the tests. The quantity of coke used in the interval was found to be 176.5 kilos. (411.162 pounds). This relates to the fuel gasified—not counting the clinker and ash.

(2.) *Gas Made.*—This amounted to 463 cubic meters, or 16,351 cubic feet. This corresponds to 2.485 cubic meters (87.7617 cubic feet) per kilogramme (2.2046 pounds) of coke used—not reckoning clinker and ash, or 39.808 cubic feet of gas per pound of coke. In a note to the paper, a calculation is made so as to arrive at the net yield of gas, making allowance for the residual clinker. The corrected figure is 2.440 cubic meters (86.1725 cubic feet) per kilo. of coke, which corresponds to 39.087 cubic feet per pound of coke used.

(3.) *Water Used.*—The water vaporized was found by deducting the water left at the end of the test from that at the beginning; the level being referred to the same mark. The amount proved to be 300.592 liters—say, 300.6 liters (66.16 gallons). This corresponds to 1.611 kilos. (3.7698 pounds) per kilo. of coke used (say, 1.709 pounds of water vaporized per pound of coke), not counting clinker and ash; or 64.92 kilos. (143.124 pounds) per cubic metre (35.3166 cubic feet) of gas made—say, 4.052 pounds of steam per cubic foot of gas. The figure of 1.611 kilos. per kilo. of coke is corrected, in the note previously referred to, to 1.584 kilo. (3.402 pounds) per kilo. of coke gasified—say, 1.584 pounds of water vaporized per pound of coke gasified.

(4.) *Speed of Air Blast.*—This was measured by an anemometer placed on the center line of the blowpipe 210 mm. in diameter (about 8 inches). The speed was found to be equal to 8.83 meters, or very nearly 20 feet per second.

(5.) *Laboratory Tests.*—The average of ten tests on the calorific power of the gas at 15° C, and 761 mm. was found to be equal to 2,772 calories, water condensed. [An appendix to the report gives details of 23 tests with the Junkers calorimeter—12 on gas mixed with 20 per cent. of water gas—the average heating power being 5,566 calories.] Of condensed water, 55.970 grammes were collected for 150 liters (5.297 cubic feet) of gas burnt. This corresponds to 373 grammes per cubic meter, and to an amount of hydrogen of about 46.27 per cent. Analyses of the gas gave the following percentage results:

Carbonic acid (CO_2)	3.4	3.4	3.8
Oxygen (O)	0.1	0	0
Carbonic oxide (CO)	43.0	42.9	42.7
Hydroged (H)	46.7	48.8	49.3
Nitrogen (N)	6.8	4.9	4.2

(6.) *Clinkering.*—This could only be done about 2 hours after the 10 hours' test was over, owing to the plant having to be continued in action for the needs of the works. It was effected with great ease by a stoker and his assistant. It took less than 15 minutes for one of the generators, and a little more than 10 minutes for the other. Both generators had been in work for nearly 14 hours. The small quantity of clinker was undoubtedly due to the slight amount of ash in the coke used; but the absence of any sticking of the clinker to the sides, and the facility with which it was removed, should be noted none the less.

(7.) *Analysis of the Coke Used.*—A series of analyses on an average sample of the coke used gave results which are recorded in the report, the average of which is: Moisture, 2.23 per cent. The amount of dry matter was: Volatile matter, 1.16 per cent.; fixed carbon, 92.06 per cent.; ash, 6.78 per cent. The coke, which had very little ash, was made from Westphalian coal, which had been in store for about three months.

Lastly, the report says that the excellent photometrical results that were obtained were owing to the exceptional quality of the coal used.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE Gas Machinery Company has been awarded contracts to install ammonia concentrators at Altoona, Pa., and Terre Haute, Ind. This is in line with our editorial of last week advising the greater refinement of by-products.

THE Quebec Company has reduced the price of gas from $1.75 to $1.50 for light and $1.15 for fuel, and under the management of R. A. Wallace, who goes there from Ontario, the Company will have a "standard" gas office instead of a works office, and it will be located in a convenient part of the business locality of Quebec. It is possible that the Company will also put in an electric plant.

THE quarterly statement of the United Gas Improvement Company, Philadelphia, Pa., for the quarter ending June 30, 1906, shows that the amount of gas consumed was 1,637,865,210 cubic feet and the money collected amounted to $1,755,279. The amount of money due the city under the provisions of the lease was $175,527.90. During the quarter ending June 30, 1905, the amount of gas sold was 1,533,925,530 cubic feet and the amount due the city of Philadelphia was $165,954.71.

MAYOR CUTLER has served a formal complaint against the Rochester (N. Y.) Railway and Light Company on the State Gas and Electric Commission. The Gas Company is owned by the Vanderbilt Andrews syndicate, which took it over at the time it obtained control of the street

railways. The two were owned by one corporation. The complaint charges that the gas contains impurities, which have caused at least one death; that the Company has a monopoly of the sale of gas and electricity for power, heating and lighting purposes; its prices are excessive and unreasonable and the Company is largely over-capitalized. Improper and defective system of gas distribution is alleged, also unreasonable and oppressive demands on consumers using electricity for lighting purposes. It is alleged, finally, that the Company has a contract with the Niagara Falls transmission companies restricting the sale of gas and electricity by those companies to the Rochester Railway and Light Company.

THROUGH the Gas and Electric Development Company, of Philadelphia, some Southern capitalists have purchased the Gas and Electric Plants at Frostburg, Md., formerly owned by the Frostburg Illuminating and Manufacturing Company.

ON the resignation of Mr. H. B. Ivett, Mr. H. B. Rust was appointed General Manager of the Westerly (R. I.) Gas and Electric Company.

MARION, IND., contemplates the erection of gas plants; natural gas has almost petered out.

THE special election on September 1, to decide the question of issuing some $305,000 of bonds for the improvement and enlargemeut of the water, gas and electric plants and the payment of the $55,000 of bills left by the former board of control, is vitally important to the people of Hamilton, O. These plants are now in such condition that they can't be run at a profit. The water supply of the city is likely to fail in any crisis; and that means irreparable disaster. The situation is so serious that business sense and mere self-preservation suggest a favorable vote for private ownership.

THE Bristol Company has just published a handy, small catalogue, Number 41, showing its recording instruments.

MOODY'S Manual of Railroads and Corporation Seeurities has just been issued, and has a large amount of gas, financial and other data.

THE East Orange, N. J., City Council contemplates plunging the city into that will-o'-the-wisp, municipal ownership. It is discussing the installation of a gas, electric light and garbage plant.

THE Meriden (Conn.) Gas Company, under the able management of Mr. Chas. A. Learned, has reduced its price of gas 5 times in 10 years, from $1 80 to $1.15 per 1,000 cubic feet, the latter price going into effect November 1st—600 stoves have been installed this year, making a total of 4,500 in use in that city. This Company by its liberal management is in a highly prosperous condition.

CALDWELL, N. J., will be supplied with gas from Newark—a franchise has just been granted the Public Service Corporation at $1.25 per 1,000, and 5 cents less per 1,000 every year for 5 years.

MESSRS. DEILY & FOWLER will build a 200,000 cubic foot holder at Bridgeport, Conn., this year.

THE Sedalia (Mo.) Water Gas and Electric Company disclaim the need of a receiver, having paid the $60,000 semi-annual interest which it defaulted on March 1st.

IT has been decided by the Lincoln (Ills.) Gas Company that H. L. Olds, who for a number of years past has been Superintendent of the local Gas Company, will continue to have general supervision over the work after he leaves for Detroit, Mich., as sales agent for the Lloyd Construction Company. James Hoblit, of the State Bank, will assist Mr. Olds and will be the resident in charge of the business.

THE Dansville (N. Y.) gas and electric plant has been sold to W. W. Lavering, of Philadelphia, A. B. Beadle, of New York city, and M. A. Maxwell, of Easton, Pa. The new Company will expend $20,000 in improvements after taking possession August 1st.

GAS has been turned on in several of the mains in Valley Junction, Ia. Two months before the contract, time gas service has been established. The connections have not all been made yet.

THE Lawrence (Mass.) Gas Company, has offered the city 95 cent gas, the present net price being $1. The city has not accepted the proposition yet.

THE Akron (O.) Gas Company, which went into the hands of a receiver because of the failure of J. R. Walsh, who is President of the Company, passed into the hands of the Mohican Oil and Gas Company, when a lease for 41 years was filed in the office of the county recorder. The lease expires October 31, 1947.

THE Lansing (Mich.) Gas Company will install a gasholder this summer.

THE San Francisco (Cal.) Gas and Electric Company has reduced the price of gas to 85 cents per 1,000 cubic feet, and is delivering a pure oil gas—water gas being abandoned.

WITH the improvements made in small gas service governors comes a partial solution of the problem of increasing output without increasing or duplicating mains. At Grand Rapids, Mich., the Gas Company is installing some 8,000 governors, beginning with the services near the works. On the other hand, however, we find the Laclede Gas Company of St. Louis, enjoining a regulator concern from attaching such devices in the house pipe systems connected with their mains.

THE new gas plant at Watertown, S. D., has been started.

ANN ARBOR and Detroit capitalists have purchased the greater proportion of the stock of the Monroe (Mich.) Gas Company. The stock was transferred and a Board of Directors elected as follows: C. O. Tippy, H. E. Bodman, W. E. Moss, J. W. Thompson, Detroit; H. A. Conant, J. C. Sterling and Boyez Dansard, Monroe. The officers are: President, H. A. Conant; Vice-President, J. W. Thompson, Detroit; Secretary, J. C. Sterling; Treasurer, W. E. Moss, Detroit.

THE City Gas Company, of Beatrice, Neb., will spend $10,000 on its plant and mains immediately.

THE Hampton (Ia.) Gas Company is making rapid progress in the installation of its plant.

THE Chelmsford (Mass.) Gas Company has been organized with Mr. E. D. McVey as President.

THE town of Dalton, Ga., owns its gas and water works, and has found it necessary to raise the price of gas 30 cents per 1,000, and the water rate is also raised 33 per cent.—in addition to this unusual occurrence the tax rate has been raised 10 cents. So much for the municipal experiment in this town.

HEATING companies are largely on the increase, and are run to the best advantage in connection with gas and electric light interests. Lockport, N. Y., and Lexington, Ky., companies are now in the game. The former very much so with competition.

AT a meeting of the Directors of the Fitchburg Gas and Electric Light Company it was voted to give Frank P. Morgan, for many years foreman of outside construction work, $1,000, and to allow him full pay to July 1, in appreciation of past services. Mr. Morgan suffers from paralysis.

ARRANGEMENTS have been made by which the Amherst (Mass.) Gas Company will receive the electric power necessary to supply the demands of Amherst, Sunderland, Hatfield and Pelham from the plant of the Turners Falls Company. Wires will conduct the electricity from Turners Falls, a distance of about 18 miles, to the Gas Company's plant in Amherst, where it will be transformed and distributed.

BY rejecting the proposition of the Pawtucket (R. I.) Gas Company, asking for a 15-year exclusive franchise, the Common Council, of Central Falls, caused a feeling of disappointment to pervade the city. It had been generally expected that the contract would be accepted, the same as has been the case in Pawtucket, Cumberland and Lincoln, and much indignation has been created because of the action of the Council, which means that consumers of gas will have to continue paying the present rates.

THE body of Charles Flannagan was found in the holder tank of the Fishkill and Matteawan (N. Y.) Gas Company. It is not known how the accident occurred.

MR. H. C. HIGGINS, of Dixon, Ills., is asking for a gas franchise at Escanaba, Mich.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHAS. E. SANDERSON,
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NOTIFICATION RESPECTING ADVERTISING.

Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:

New York—American News Co., 39 and 41 Chambers St
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, AUGUST 13, 1906.

The Market for Gas Securities.

The executive committee of the Consolidated Gas Company, of New York city, adjourned without announcing any action on the dividend question. Brooklyn Union Gas Company is nominally quoted at 110–130, with no sale since the Company passed its dividend, which shows how closely the stock is held.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

AUGUST 13.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	138½	139
Central Union Gas Co.—				
1st 5 s, due 1912, J & J	3,000,000	1,000	101	104
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	..	105
Mutual	3,500,000	100	225	250
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	100	103
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1st Mtg Gold Bds. 5 p. ct.	1,000,000	..	98	104
Northern Union—				
1st 5's, due 1927, J. & J	1,250,000	1,000	101	103
New York and East River—				
1st 5 s, due 1941, J. & J.	3,500,000	1,000	108	111
Con. 5's, due 1945, J. & J.	1,500,000	..	104	110
Standard	5,000,000	100	140	160
Preferred	5,000,000	100	155	175
1st Mtg. 5's due 1930, M.&N.	1,500,000	1,000	104	108
The Brooklyn Union	15,000,000	1,000	120	130
1st Con. 5's, due 1948, M.& N.	15,000,000		107	..
Yonkers	299,550	500	130	..
Out-of-Town Companies.				
Bay State	50,000,000	50	5/16	¾
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	..	65
" 1st Mtg. 5's	509,000	1,000	95	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	9	10
" " Bonds, 5's	5,250,000	1,000	75	80
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	106¾
Cincinnati Gas and Electric Co.	29,500,000	100	103½	103¾
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	90	.
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	..	95
Preferred	3,026,500	100	107½	108
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	..	89
Mortgage, 6's	3,600,000	..	..	115
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	..	..	100
Detroit City Gas Co	5,000,000	50	..	50
" Prior Lien 5's	4,618,000	1,000	..	98
Detroit Gas Co., 5's	981,000	1,000	75	80
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	..	110	112
" Bonds, 5's	10,500,000	..	107½	108½
Indianapolis	2,000,000	..	60	70
" Bonds, 5's	2,650,000	..	104½	105
Jackson Gas Co	250,000	50	82	..
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	..	105
Preferred	2,500,000	100	95	110
Bonds	10,000,000	1,000	104	104¼
Lafayette Gas Co., Ind.	1,000,000	100	..	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas & Elec. Co.				
" 1st Mtg. 6's	350,000	1,000	106	108¾
" 6 per cent. scrip, due 1910	100,000	25	85	87
Massachusetts Gas Companies of Boston	25,000,000	100	58	58¼
Preferred	25,000,000	100	88	88¼
Montreal, Canada	2,000,000	100	218	218¾
Nashville Gas Lt. Co.	1,000,000	100	110	.
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	6,000,000	..	137	138
New Haven	2,000,000	25	200	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	10½	98
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	30,100,000	1,000	..	..
2d "	2,500,000	1,000	104	.
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	104½	105¼
San Francisco, Cal.	15,800,000	100	..	..
St. Joseph Gas Co. 1st Mtg. 5's	751,000	1,000	93	.
St. Paul Gas Light Co	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	96¾	..
Syracuse, N. Y.	1,975,000	100	50	55
Bonds	2,047,000	1,000	102	..
Washington, D. C	2,600,000	20	300½	301
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Western, Milwaukee	4,000,000	..	..	..
Wilmington, Del	600,000	50	230	.

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at the October meeting, in Chicago. Contributors to this department, please send your current advertising matter, schemes for sales, photographs of salesrooms and other contributions before *September 15th*, when the book will go to press.

GEORGE WILLIAMS, EDITOR,
60 Wall Street, New York.

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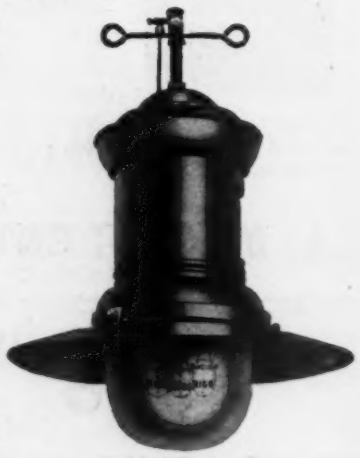

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Cleethorpes Gas Co	25,000	Water Gas Make.
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Halifax Corporation	100,000	Carburetted Water Gas.
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We have been permitted by the recipients, an American constructing concern, to reproduce the following letters recently received in reply to inquiry respecting Rotary Station Meters made of three important English gas works' engineers, all of whom enjoy enviable reputations and are everywhere among their fellow workers recognized for the skill, ability and success which has attended their administrations of the properties with which they are connected. The originals of these letters, together with many more of similar tenor, are on file in our office and open to the inspection of any prospective purchaser of Rotary Station Meters.

DEAR SIRS:

In answer to yours of the 27th March, I have pleasure in stating that we have had an 80,000 cu. ft. per hour Rotary Station Meter in use in connection with our Water Gas Plant for almost 18 months; during the greater part of this time we worked in series with our ordinary station meter, and found its registration accurate. I am so satisfied with it that I am about to place an order with the firm for a meter to pass 180,000 cu. ft. per hour of coal gas.

Yours faithfully, _____

DEAR SIRS:

In reply to your enquiry of the 27th March *re* Rotary Meter, I have not the slightest hesitation in stating that the meter we have in use here is giving every satisfaction.

It is 15,000 cu. ft. per hour and fixed at the outlet of Condensers of our Carburetted Water Gas Plant, and of course in the inlet of the Relief Holder, and is working under extreme conditions.

It is fixed underground, and since we have had it, *viz.*, 3 years, we have only taken it out once for examination (and this out of curiosity); as you will quite understand, there is a lot of oil, tar, etc., in contact with the meter at this point, and we thought it might be getting clogged up, but were pleased to find that such was not the case.

From our experience we have not the slightest hesitation in recommending its adoption to all gas makers.

I shall be pleased to reply further if necessary

Yours very faithfully, _____

GENTLEMEN:

In reply to yours of March 27th respecting the Rotary Station Meter in use at these Works, I beg to inform you that the same has given every satisfaction. The meter has been registering the whole of the gas made at our Inclined Retort Section for the past 2½ years, and up to the present time we have not had the slightest trouble. The capacity of our meter is 100,000 cu. ft. per hour.

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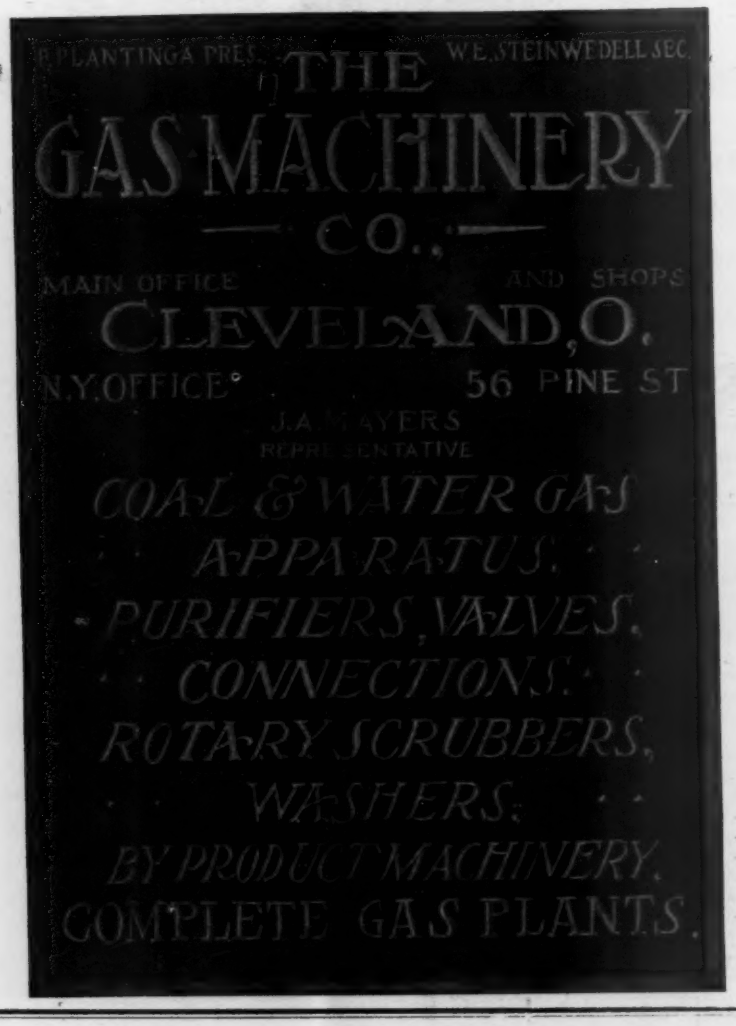

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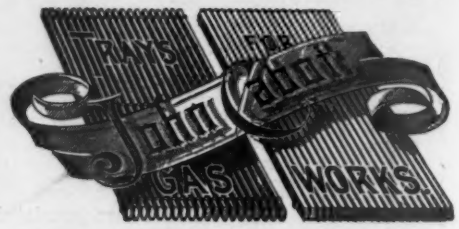

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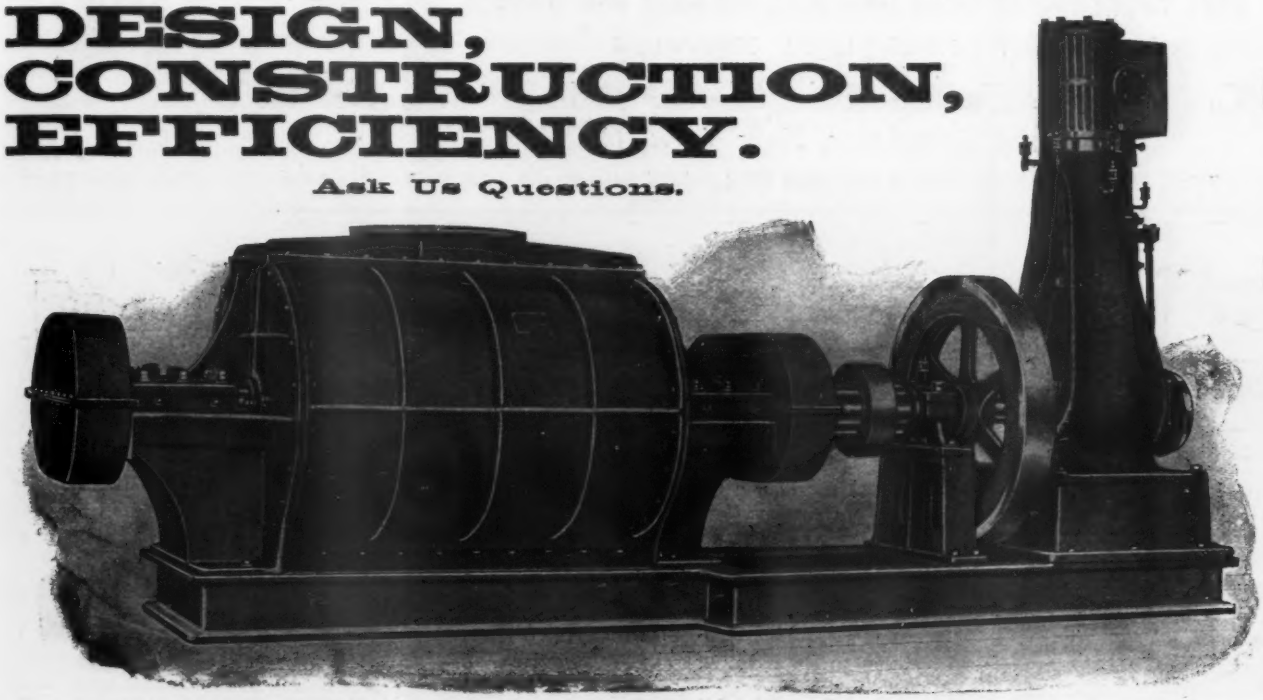

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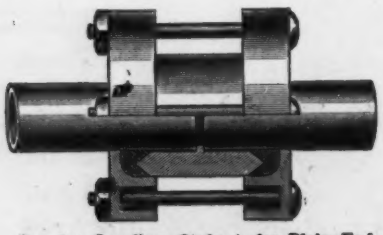
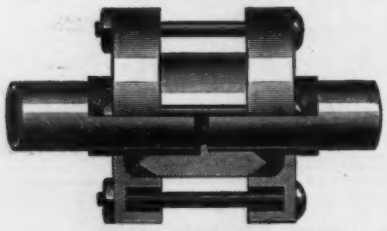
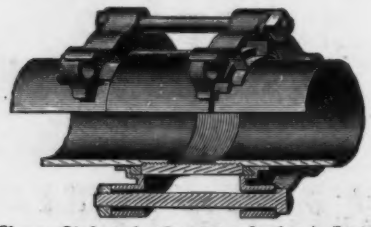


Regular Coupling, Style 1, for Plain End Wrought Iron Pipe.



Insulating Coupling, Style 5, for Plain End Wrought Iron Pipe,



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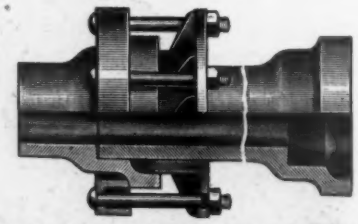
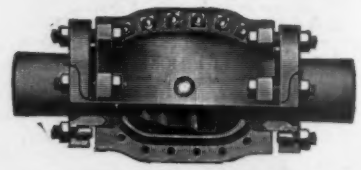
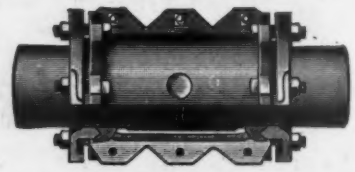


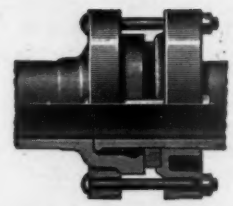
Coupling, Style 9, for Special Style Cast Iron Pipe.



Split Sleeve for Repairing Broken Bell on Cast Iron Pipe.



Split Sleeve for Repairing Broken or Cracked Cast Iron Pipe.



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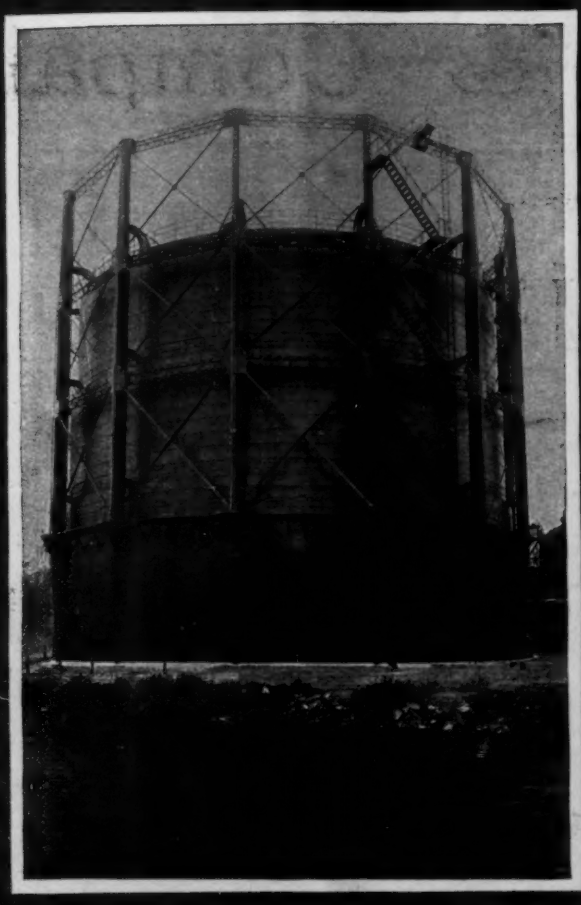

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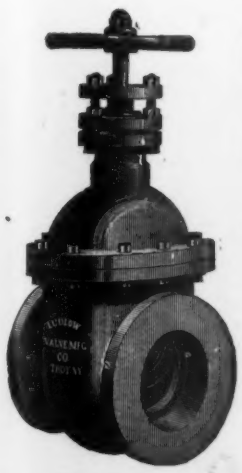

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Double and Single Gate Valves, ¾" to 72",

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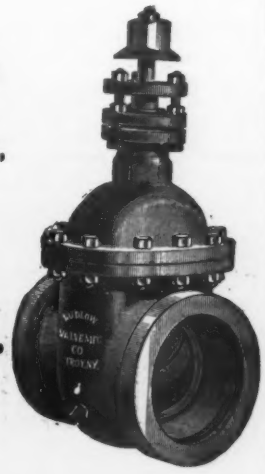

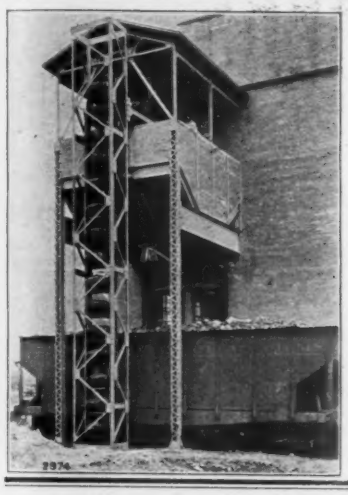

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For running coal from the front of the wharf to the storage bin or pocket. One man only is needed for the operation.

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FOR ASSESSMENT PURPOSES.

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Cox's High Pressure Fluid Discharge Computer.

This Computer solves the following formula, which is applicable to Gas, Air and other elastic fluids, flowing through long pipes with high initial pressures:

Discharge in cubic feet per hour at atmospheric pressure $= 33.3 \sqrt{\frac{d^5 \times (p_1^2 - p_2^2)}{L \times w}}$

Where
d = diameter of pipe in inches,
p_1 = absolute initial pressure in pounds per square inch,
p_2 = absolute terminal pressure in pounds per square inch,
L = length of pipe in miles,
w = specific gravity of the fluid when air = 1.

To Find the Discharge from a Pipe and the Required Size of Pipe.

(1.) Set the specific gravity of the fluid opposite the length of pipe;

(2.) Bring the DIFFERENCE of the initial and terminal gauge pressures opposite the SUM of the initial and terminal gauge pressures;

(3.) Opposite any diameter of pipe will now be found the discharge in cubic feet per hour at atmospheric pressure; and

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The work of installation is in progress; an additional car load of lamps is in transit and others to follow.

We believe this to be one of the most noteworthy contracts over obtained on gas lighting work.

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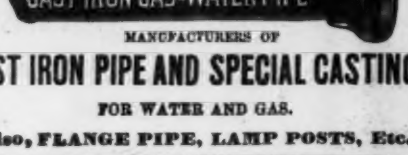

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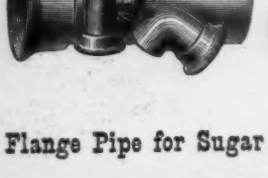

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Photometrical and Experimental Apparatus.

PUBLIC LIGHTING TABLE.

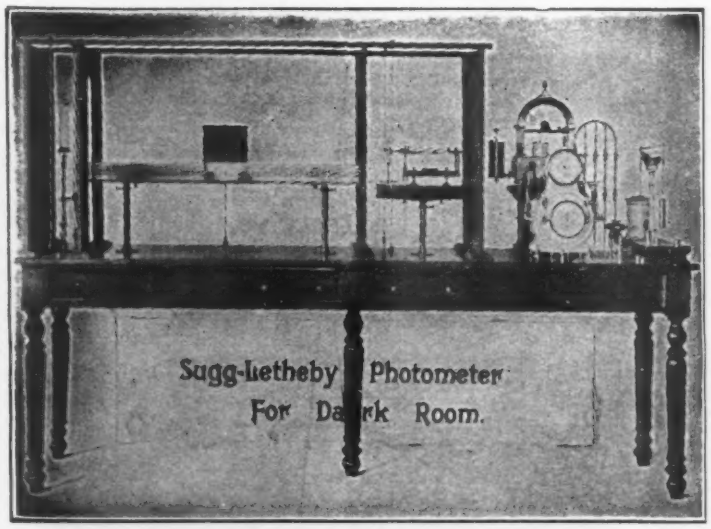
SEPTEMBER, 1906.

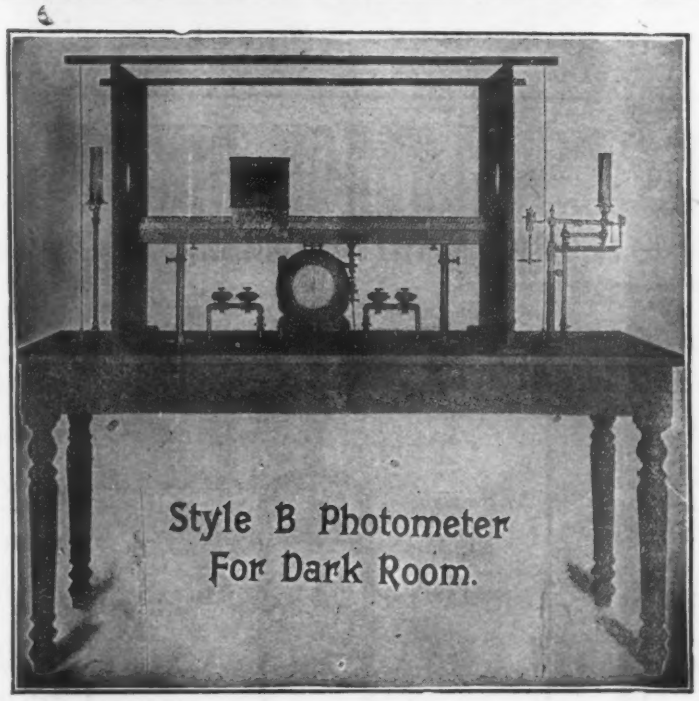
Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.
Sat.	1	No L.	No L.
Sun.	2	No L. PM	No L.
Mon.	3	No L.	No L.
Tue.	4	7.00 PM	8.40 PM
Wed.	5	7.00	9.10
Thu.	6	7.00	9.40
Fri.	7	7.00	10.10
Sat.	8	7.00	10.40
Sun	9	6.50	11.10
Mon.	10	6.50 LQ	11.50
Tue.	11	6.50	12.40 AM
Wed.	12	6.50	1.30
Thu.	13	6.50	2.20
Fri.	14	6.50	3.20
Sat.	15	6.50	4.40
Sun.	16	6.30	4.40
Mon.	17	6.30	4.40
Tue.	18	6.30 NM	4.40
Wed.	19	6.30	4.40
Thu.	20	6.30	4.40
Fri.	21	6.30	4.40
Sat.	22	6.30	4.40
Sun.	23	8.40	4.50
Mon.	24	9.30 FQ	4.50
Tue.	25	10.30	4.50
Wed.	26	11.30	4.50
Thu.	27	12.30 AM	4.50
Fri.	28	1.40	4.50
Sat.	29	2 40	4.50
Sun.	30	3.50	4.50

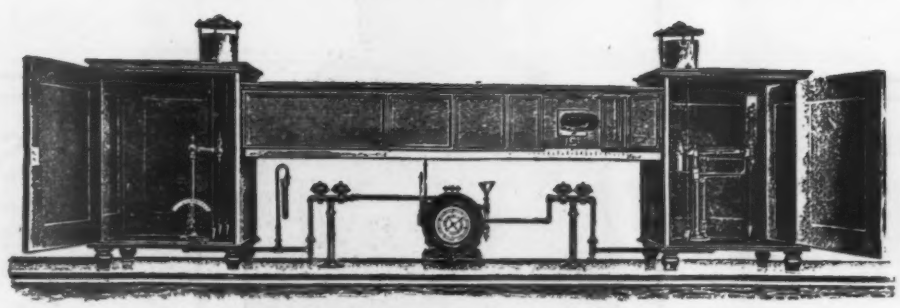
TOTAL HOURS DURING 1906.

By Table No. 1.

	Hrs.Min.
January	223.40
February	190.40
March	192.10
April	167.00
May	152.20
June	142.10
July	150.20
August	157.40
September	170.00
October	185.10
November	201.40
December	214.00
Total, yr.	2146.50







Closed Photometer For Light Room.

CIRCULARS SENT ON REQUEST.

PUBLIC LIGHTING TABLE.

SEPTEMBER, 1906.

Day of Week.	Date.	Table No. 2. NEW YORK CITY. All Night Lighting. Light.	Extinguish.
		P. M.	A.M.
Sat.	1	6.30	4.20
Sun.	2	6.30	4.20
Mon.	3	6.15	4.30
Tue.	4	6.15	4.30
Wed.	5	6.15	4.30
Thu.	6	6.15	4.30
Fri.	7	6.15	4.30
Sat.	8	6.15	4.30
Sun.	9	6.15	4.30
Mon.	10	6.05	4.40
Tue.	11	6.05	4.40
Wed.	12	6.05	4.40
Thu.	13	6.05	4.40
Fri.	14	6.05	4.40
Sat.	15	6.05	4.40
Sun.	16	6.05	4.40
Mon.	17	5.55	4.50
Tue.	18	5.55	4.50
Wed.	19	5.55	4.50
Thu.	20	5.55	4.50
Fri.	21	5.55	4.50
Sat.	22	5.55	4.50
Sun.	23	5.55	4.50
Mon.	24	5.40	5.00
Tue.	25	5.40	5.00
Wed.	26	5.40	5.00
Thu.	27	5.40	5.00
Fri.	28	5.40	5.00
Sat.	29	5.40	5.00
Sun.	30	5.40	5.00

TOTAL HOURS DURING 1906.

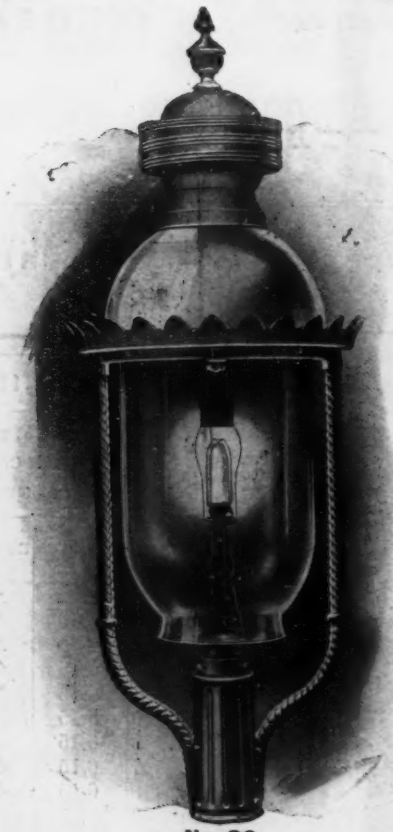
By Table No. 2.

	Hrs.Min.
January	423.20
February	355.25
March	355.35
April	298.50
May	264.50
June	234.25
July	243.45
August	280.25
September	321.15
October	374.30
November	401.40
December	433.45
Total, yr.	3987.45

NEW YORK, 318 West 42d Street.
BOSTON, 820 Beacon Building.
PHILADELPHIA, Broad and Arch Streets.
ST. LOUIS, 712 Roe Building.
CHICAGO, 218 La Salle Street.
SAN FRANCISCO, 512 Oak Street.

WELSBACH STREET LIGHTING COMPANY

....OF AMERICA....



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Controls and Operates the **Welsbach System of Street Lighting,**

Which includes its specially DESIGNED and PATENTED BURNER for PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

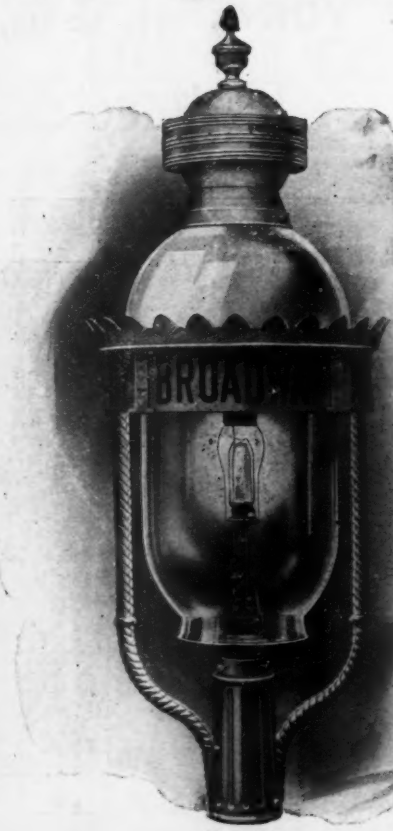
POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others interested in Municipal and Outside Lighting.



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Standard Length, 30 inches.
The New No. 7 Welsbach Dining Room Fixture, when ordered, will be sent complete, as follows:

1 No. 7 Harp Fixture and Brass Crown finished in Brushed Brass.
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1 No. 4197 Mantle — Intensive Brand.
1 No. 306 Chimney (air hole).
1 Fourteen-inch GREEN Art Glass Shade, with six-inch Green Beaded Fringe.

VARIATIONS.

Finished in oxidized copper, oxidized brass, etc., 25 cents extra.

Shades in Ruby and Green--Ruby, Amber and other colors, without extra charge.

Special colors require a few days extra time to fill orders.

Green Shades will be shipped unless otherwise ordered.

This fixture is being largely used by Gas Companies as a dining room fixture at the popular retail price of $10 complete, and is a great favorite for moderate sized two and three-story residences. In popularity and price it is unequalled.

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For the Six Months Ending July 1st, 1906, has been Awarded Contracts for 25 Sets of

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Memphis, Tenn. (2d contract).	**Omaha, Neb.**	**Peekskill, N. Y.** (2d contract).
Council Bluffs, Ia. (2d contract).	**Muskegon, Mich.**	**Waterville, Me.**
Seattle, Wash. (2d contract).	**Nazareth, Pa.** (2d contract).	**Washington, D. C.** (3d contract).

TOTAL SETS TO JULY 1, 1906, - - - - - 618

TOTAL DAILY CAPACITY TO JULY 1, 1906, 488,930,000 CUBIC FEET.

The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

Established 1858. Incorporated 1890.
CHAS. E. GREGORY, Prest. DAVID R. DALY, V.-Prest. & Treas.
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Linings for Water Gas Apparatus, High Grade Fire Brick of All Shapes and Sizes, Ground Fire Clay, Ground Fire Brick in Bulk or in Barrels.

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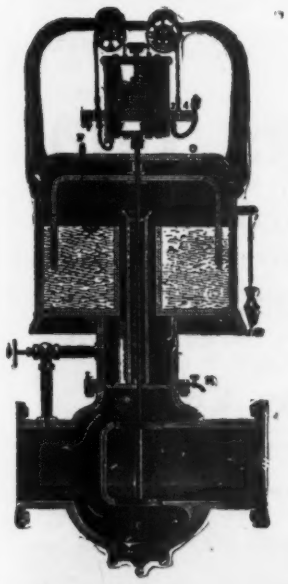

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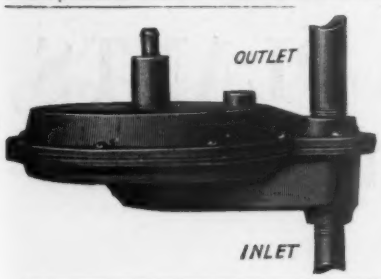

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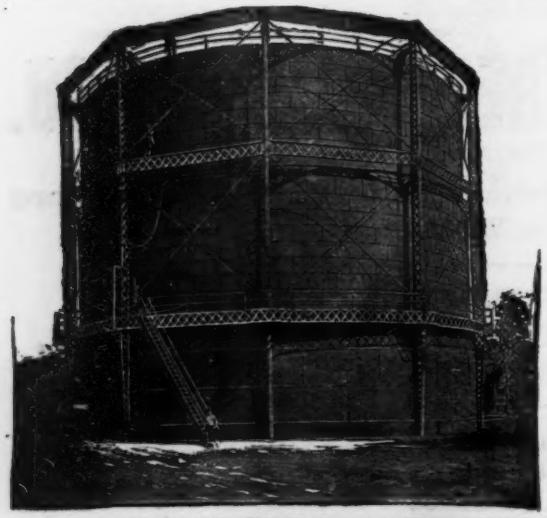

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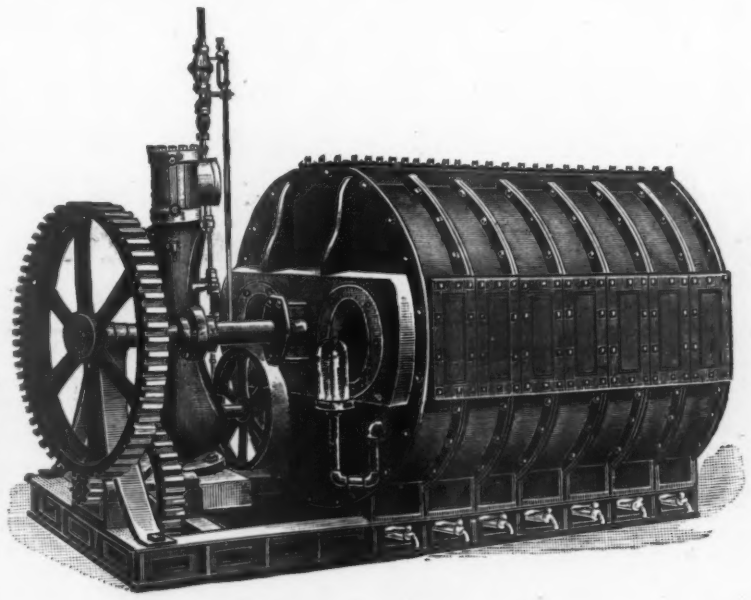

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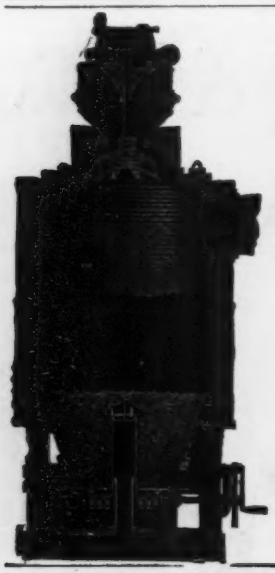

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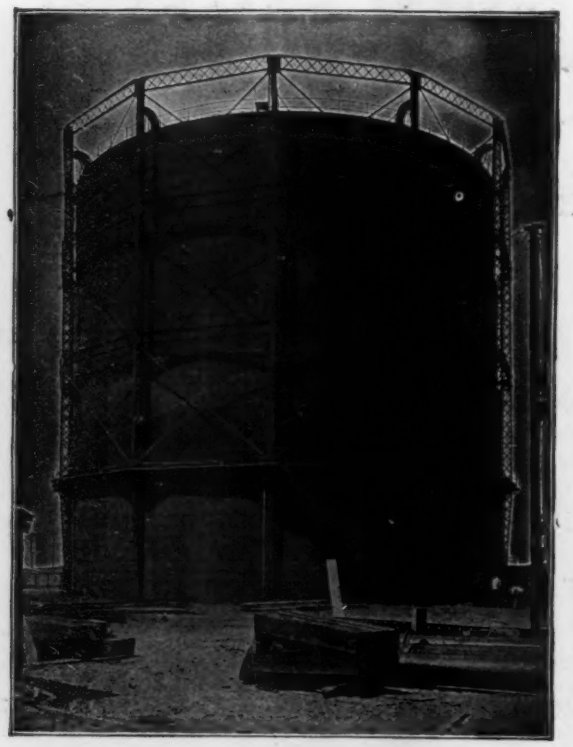

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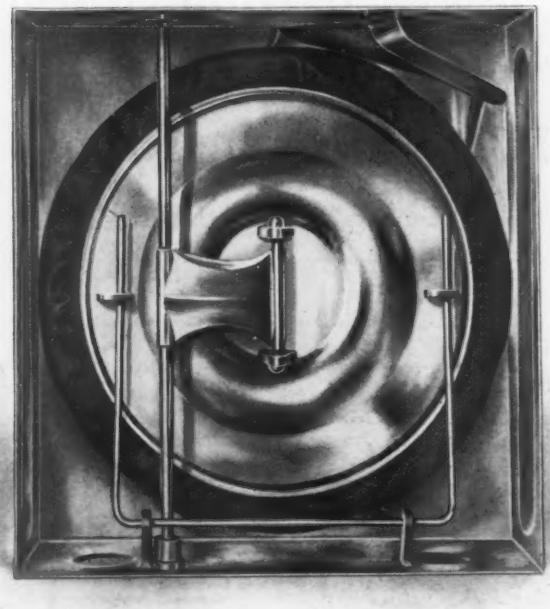

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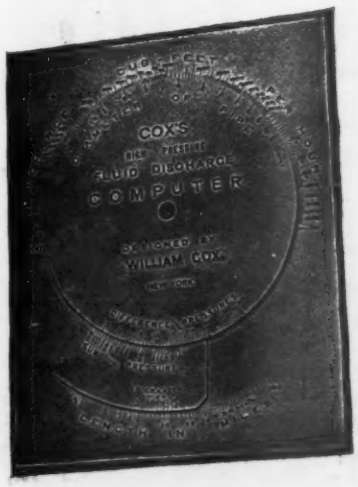

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